

A
COMPLETE TREATISE
ON
PRACTICAL ARITHMETIC;
AND
BOOK-KEEPING,
BOTH BY
SINGLE AND DOUBLE ENTRY.

ADAPTED TO THE USE OF SCHOOLS.

THE SEVENTH EDITION.

BY CHARLES HUTTON, LL.D. AND F.R.S.

LONDON:
PRINTED FOR G. G. J. AND J. ROBINSON, AND R. BALDWIN,
IN PATER-NOSTER-ROW.

M DCC LXXXV.



P R E F A C E.

TO adapt this work to the easy use of preceptors, I have every where delivered the definitions and rules in as brief a manner as possible, to make them, at the same time, general, and free from the absurdity and nonsense which commonly attend definitions in works of this kind; and have given such notes after them, as describe some particulars not essential to the general rules themselves, but tend either to explain them or to facilitate the operations; also, to each rule there is annexed a great variety of the best examples, with their answers; and where the common method of writing down the operations did not please me, I have there inserted the work of an example, at large, in the method which I think most convenient.

The operations of addition, subtraction, multiplication, and division, are delivered, first in simple numbers, and afterwards in compound; thinking *that* the properest order, in which they can be taught. But I would not be understood to mean, that it is always necessary to have these or any other of the rules copied into the pupil's book in the very order in which they are inserted; for they are all delivered in such manner as to have little or no dependence on each other, that they may be taught in what order every master chooses: nor that it is ever necessary to copy out the first simple rules; but if any master choose to do it, I would advise him to make his scholars run over these first upon their slates or waste papers; then begin them again, and write them, with an example or two to each, in their books; and thus he may with ease mix the simple and compound rules together. Also, though I have inserted little or nothing superfluous in any of the problems or general rules, the judicious teacher may omit any notes or particular cases he may think fit. And if all the pupils have printed books, as they ought, then they may either write all the rules and examples in their books, or they may omit the rules and notes, and write down only the work of their examples, especially where the rules are long and tedious to write. These advantages, together with that of having the book always about them, to get off any precepts or tables when they are out of school, will fully repay them the small expence of the book. It is also a good practice in some preceptors, to procure parcels of these books interleaved with writing paper and bound up, for their pupils to enter there examples on after they are calculated; as by giving to every one of them a copy so bound, the expence of a large paper book is saved, as well as the trouble of writing down the rules, &c. I must here also caution some masters against that foolish method of writing down the pupils rules and examples, especially in addition and subtraction, both of integers and of decimals; for, in these rules, this is often the only difficulty, and the best part of his exercise; and on this account I have given most of the questions in a form different from that in which they commonly are proposed.

P R E F A C E.

Reduction is placed before the rules of addition, subtraction, multiplication, and division of compound numbers; because, in my opinion, compound addition is best performed by it; and in compound division it is absolutely necessary. But every one may teach them in what order he shall think fit; for the tables of money, weights, and measures, may be as conveniently inserted in compound addition as in reduction, if they be copied at all in any part; which, however, I think is needless, and only wasting time, especially if the scholar has a printed book: also, if any masters choose to make their pupils copy their tables, but not in the form they here stand, they may easily cause them to turn these tables into the common form upon a slate, or waste paper, and copy them from thence into their books; and this will be no bad exercise for them.

In the rule-of-three, I have neglected the common distinction of it into direct and inverse; and have given one general rule for the stating and operation, perfectly easy in every respect: which rule is so comprehensive, that it also includes the questions of the compound rule, or rule-of-five; and that not only those which are commonly given in books, wherein the statings are either both direct, or one direct and the other inverse, but also those in which the statings are both indirect.

The fractions are pretty largely treated of, and particularly the abbreviating part; because it is of the greatest use by serving to abridge the operations in all the other rules. The advantage of fractions is so great, that I dare affirm it, a person who is well acquainted with them, will perform as many calculations as four or five who are not. In decimals the separating points are placed against the upper part of the figures; which prevents them from being mistaken for stops or pauses in the reading; the hint of which I had from some tables in Sir *Isaac Newton's* optics.

In compound interest, where the time, at which the interest is supposed to be payable, is some part of a year, I have, in my calculations, accounted the rate corresponding to that time, the same part of the rate for the whole year; thus at 5 *per cent. per annum*, the rate for half-yearly payments I make $2\frac{1}{2}$, and for quarterly payments, $1\frac{1}{4}$, &c. I say this here to shew upon what supposition those examples are calculated, as it is contested whether this method ought to be used or not.

In the extraction of roots I have given a new, general, and very expeditious method, by which the third and higher roots may be found without the intolerable labour attending the common methods.

In this edition are made many useful alterations and additions in several parts of the book, as will appear on the perusal of it. There is also now printed a supplement to this arithmetic, in a separate small pamphlet, for the use of teachers, containing the solutions, at full length, of all the questions in the promiscuous collection proposed in pa. 137 at the end of the rules of arithmetic in this book.

C O N T E N T S

C O N T E N T S.

	Page
N OTATION	7
A Synopsis of the Roman notation	9
Simple Addition	10
----- Subtraction	11
----- Multiplication	12
----- Division	15
Reduction	19
Compound Addition	25
----- Subtraction	30
----- Multiplication	33
----- Division	35
Rule-of-Three	36
Rule-of-Five	41
Practice	43
Bills of Parcels, Book-Debts, &c.	54
Tare and Tret	58
Vulgar Fractions	61
Reduction of Vulgar Fractions	62
Addition of Vulgar Fractions	70
Subtraction of Vulgar Fractions	71
Multiplication of Vulgar Fractions	72
Division of Vulgar Fractions	73
Rule-of-Three in Vulgar Fractions	74
Rule-of-Five in Vulgar Fractions	75
Decimal Fractions	76
Addition and Subtraction of Decimals	ibid
Multiplication of Decimals	77
Division of Decimals	79
Reduction of Decimals	81
Rule-of-Three in Decimals	84
Rule-of-Five in Decimals	85
Simple Interest	ibid

C O N T E N T S.

Compound Interest	-	-	-	-	90
Discount	-	-	-	-	91
Equation of Payments	-	-	-	-	93
Single Fellowship	-	-	-	-	94
Double Fellowship	-	-	-	-	96
Barter	-	-	-	-	97
Loss and Gain	-	-	-	-	99
Exchange	-	-	-	-	101
Arbitration of Exchanges	-	-	-	-	105
Alligation	-	-	-	-	109
Involution	-	-	-	-	114
Evolution	-	-	-	-	117
Of Proportion in general	-	-	-	-	125
Arithmetical Progression	-	-	-	-	127
Geometrical Progression	-	-	-	-	130
Single Position	-	-	-	-	132
Double Position	-	-	-	-	135
A Promiscuous Collection of questions	-	-	-	-	137
Book-keeping by Single Entry	-	-	-	-	145
Book-keeping by Double Entry	-	-	-	-	177

A

C O M P L E T E S Y S T E M

O F

Practical Arithmetic.

PRACTICAL ARITHMETIC is the art of numbering, or of performing calculations by numbers.

N O T A T I O N .

NOTATION is the expressing of any proposed number, either by words or characters.

All numbers are expressible by these ten characters or figures, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, or cypher, and the usual method of notation by these figures is so contrived, that any character is increased in its value in a tenfold proportion for every place it is removed to the left among the other figures with which it is connected; so in these figures 333, the first 3 (reckoning from the right to the left) is 3 ones, but the second is 3 tens, and the third is 3 hundreds; also in these 2759, the 9 represents 9 ones, but the 5 represents 5 tens, the 7 is 7 hundreds, and the 2 is 2 thousand. And although the cypher signify nothing by itself, yet when put on the right of any of the other figures, it increaseth their value in the same tenfold proportion above described; thus, though 2 standing alone, or in the first place, represent only two ones, yet when a cypher is written on the right of it thus, 20, it represents 2 tens, or twenty; and if another cypher be affixed thus, 200, it will represent 2 hundreds, &c.

For the more easy reading of large numbers, when they are expressed by figures, they are divided from the right hand towards the left, into periods and half-periods, each half-period consisting of three figures; the common name of the first period being units, or ones; of the second, millions; of the third billions; of the fourth trillions, &c.

Also the first half of any period is so many ones of it, but the latter half is so many thousands of it.

The following example exhibits a summary of this whole doctrine :

Quintillions	Quadrillions	Trillions	Billions	Millions	Units
th. un.	th. un.	th. un.	th. un.	th. un.	c.x.t.c.x.u.
4373,829.	759,761.	235,871.	296,473.	918,651.	437,256.

Note, The first nine characters are called significant figures, to distinguish them from the cipher, which of itself is insignificant. Also a number expressing a quantity of one name or denomination, is called a simple number, as 20 pounds, or 17 gallons, or 5 days; and that representing a quantity of several names, is called a compound number, as 13 pounds 5 shillings and 6 pence, or 17 gallons and 2 pints, or 5 hours and 50 minutes.

I. Having any number proposed in words, to express the same in figures.

RULE.

Write down ciphers to so many periods and places as are named in the given number; then beginning at the left, observe at each place what significant figure is named, and, taking away the cipher, write the significant figure in its place.

EXAMPLES:

1. Express in figures, four thousand, one hundred and seventy-three.
2. Write down in figures, Twenty-three millions, two hundred and sixty thousand, nine hundred and thirty.
3. Write in figures, Four thousand and twenty-five millions, one hundred and three thousand, and six.
4. Express in figures, Two hundred seventeen thousand and fifty millions, eight thousand, seven hundred, and sixteen.
5. Write down in figures, Seventy thousand billions, one hundred three thousand and fifty millions, three thousand and eight.
6. Express in figures, Eight hundred trillions, one hundred seventy-five thousand seven hundred and forty-eight billions, three hundred thousand millions, five thousand and seventy.

II. Having any number expressed in figures, to read the same or to express it in words.

RULE.

Divide the figures in the given number, as in the general example above, into periods and half periods, by any convenient

venient marks; then beginning at the left, the figures are thus read, viz. the first figure of each half period is named by itself with the word *hundreds*, but the other two are named together; and at the end of the first half of each period, the word *thousands* is named; but at the end of the other half, the common name of the whole period, except it be the units period, whose name is not expressed.

EXAMPLES.

1. Let it be required to express in words, 17359.
2. Write down in words, 7301462.
3. Write down in words, 3920500706.
4. Express in words, 102003000400.
5. Write in words, 2073000091630702.
6. Write down in words, 503002786940003.

A SYNOPSIS of the ROMAN NOTATION.

1	=	
2	=	II : As often as any character is repeated so many times
3	=	III its value is repeated.
4	=	IIII or IV: A less character before a greater diminishes its value.
5	=	V
6	=	VI. A less character after a greater increases its value.
7	=	VII
8	=	VIII
9	=	IX
10	=	X
50	=	L
100	=	C
500	=	D or ID: For every D affixed, this becomes 10 times as many.
1000	=	M or CID: for every C and D, put one at each end, it becomes
2000	=	MM 10 times as much.
5000	=	IDC or V̄: A line over any number, increases it 1000 fold.
6000	=	VĪ
10000	=	X̄ or CCICD
50000	=	ICD̄
60000	=	LX̄
100000	=	C̄ or CCCICD̄
1000000	=	M̄ CCCCICD̄
2000000	=	MM̄
&c.	=	&c.

SIMPLE ADDITION.

SIMPLE Addition is the finding of one simple number equal to several simple numbers taken all together.

The number which is equal to several taken together is called their sum.

Simple addition may be performed by this

R U L E.

1. Place the several numbers, to be added, underneath each other, so that the figures of the same name, with respect to units, tens, &c. may be straight under each other.

2. Draw a line under the lowest number; then add up the column of units, and consider how many tens are in the sum for which you must carry so many ones to the next column, writing down only the excess over and above the tens below the line straight under its proper column.

3. Add all the columns in the same manner, and the figures below the line will express the sum required.

To prove Addition. Cut off the uppermost number, by drawing a line below it. Add all the rest of the lines of numbers together, and set their sum below the sum to be proved. Then add this last found number and uppermost line together, and their sum will be the same as that found by the first addition when the work is all right.

E X A M P L E S.

1. What is the sum of 37, 509, 7126, 17630 and 459273?
2. Required the sum of 3579, 41, 96120, 725, 11, 1820, 5, and 720139.
3. What is the sum of 2591, 720396, 14, 259, 6, 370214, 9740, 53, 1692, and 137?
4. How many days are in the twelve calendar months?
5. Suppose that from London to Hatfield is 20 miles, from thence to Stilton 57 miles, thence to Newark 48 miles, thence to Doncaster 37 miles, thence to Northallerton 62 miles, thence to Durham 34 miles, and from thence to Newcastle 15 miles; how many miles are between London and Newcastle?
6. A person dying left to his widow 1500 pounds, to his eldest son he left 30500, and to each of his other two sons 3406; also 2700 to each of his three daughters, besides 751 pounds in other small legacies; what did he die possessed of?

SIMPLE

SIMPLE SUBTRACTION.

SIMPLE Subtraction is the finding how much one simple number exceeds another, or the taking a less simple number out of a greater.

The number to be subtracted is called the *subtrahend*; and that out of which it is to be taken, is called the *minuend*: also the number remaining after the one is taken out of the other, is named their *difference*.

Simple Subtraction is performed by the following

R U L E.

1. Place the subtrahend under the minuend according to the directions given in addition, and draw a line below them.

2. Begin at the right, and subtract each under figure from that which stands above it, writing the remainder straight under them below the line; so shall all the remainders together express the difference required.

3. But when any under figure exceeds that which is above it, conceive 10 to be added to the upper, and subtract the under from the sum; but in this case, you must add 1 to the next under figure, before you subtract it.

To prove Subtraction.

Add the difference and subtrahend together, and the sum will be equal to the minuend when the operation is right.

E X A M P L E S.

- 1. What is the difference between 1735 and 1897348?
- 2. How much does 540312 exceed 7953?
- 3. How much is 30491 less than 57321469?
- 4. Suppose that from London to Edinburgh (by way of Newcastle is 393 miles, and that from London to Newcastle is 273 miles; how many miles are between Newcastle and Edinburgh?
- 5. How much is A older than B, A being born in the year 1701, and B in 1739?
- 6. How much is C, whose age is 71, older than D, whose age is 34?

SIMPLE MULTIPLICATION.

SIMPLE Multiplication is the finding of a simple number which shall contain any given simple number a certain proposed number of times; and it is therefore a compendious method of addition.

The two proposed numbers are, in general, termed the *factors* of the multiplication; but in particular, that which is to be multiplied, is called the *multiplicand*; and that you multiply by, the *multiplier*; also the number found from the operation is named the *product* of the two factors.

Before proceeding to any operations in this rule, the following table of products must be learnt very perfectly:

MULTIPLICATION TABLE.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

Simple multiplication may be performed by the two following

R U L E S.

I. To multiply by a single figure, or by any number in the first line of the foregoing table of products.

Begin at the right of the multiplicand, and multiply each figure in it by the multiplier, writing down the whole of such products as are less than ten; but for such as are just equal to a certain number of tens, write down 0, and carry 1 for each 10 to the next product; and

and for such as exceed a certain number of tens, write down the excess, and carry for the tens as before.

EXAMPLES.

Multiply 1234567890 by each number separately from 2 to 12.

II. *To multiply by a number consisting of several figures.*

1. Write it below the multiplicand, and find the product for each figure in it as in the first case, not regarding in what order the lines are found, provided the first figure in each stand straight below its respective multiplier.

2. Add all the lines of products together in the same order as they stand, and the sum will be the whole product required.

To prove Multiplication. Make the former multiplicand the multiplier, and the multiplier the multiplicand, and proceed as before; and the new product will be the same as before when the work is right.—*Otherwise,* Add together the figures in each factor, casting out all the nines in the sums as often as they amount to 9. Multiply the two remainders together, and the nines cast out of their product will leave the same remainder as the nines cast out of the answer when the work is right.

EXAMPLES.

1. Required the product of 273580961 and 23?

Ans. 6292362103.

2. Required the product of 6241578309 and 37?

Ans. 230938397433.

3. What is the product of 5318625074 and 43?

Ans. 228700878182.

4. What is the product of 751900368 and 51?

Ans. 38346918768.

5. What is the product of 402097316 and 195?

Ans. 78408976620.

6. What is the product of 82164973 and 3027?

Ans. 248713373271.

7. What is the product of 16358724 and 704006?

Ans. 11516639848344.

8. What is the product of 921760035 and 520007091?

Ans. 479321754400408185.

9. What is the product of 38015732 and 400700065?

Ans. 15232906283422580.

CONTRACTIONS.

1. When there are ciphers at the right of one or both factors, proceed as before, neglecting the ciphers; and to the right of the product, place as many ciphers as are in both factors.

So

SIMPLE MULTIPLICATION.

So to multiply 390720400 by 406000 :

Having written the terms as are here annexed, and multiplied by the two significant figures of the multiplier to the sum of the two products subjoin the five ciphers which are on the right of the two factors.

$$\begin{array}{r}
 390720400 \\
 \times 406000 \\
 \hline
 23443224 \\
 15628816 \\
 \hline
 158632482400000
 \end{array}$$

EXAMPLES.

1. Multiply 718603400 by 57. - - Anf. 40960393800.
2. Required the product of 70100 and 9001635.
Anf. 631014613500.
3. What is the product of 9030100 and 21000?
Anf. 189632100000.
4. What is the product of 7030 and 81503600?
Anf. 5729703080000.

So that, if any number is to be multiplied by 1 with ciphers annexed, the product will be found by only annexing the ciphers to the figures of the multiplicand.

EXAMPLES.

1. The product of 71 and 10 is 710.
2. The product of 2103 and 100 is
3. The product of 503700 and 1000 is

III. When the multiplier is the product of two or more numbers in the table, it is often of advantage to multiply continually by those numbers instead of it.

Thus, to multiply 160430800 by 10800.

Because the component parts of 108 are 12 and 9, that is 9 times 12 produce 108; therefore multiply first by 12, and that product by 9; and to the last product affix the four ciphers which were on the right of the two factors.

$$\begin{array}{r}
 160430800 \\
 \times 12 \\
 \hline
 19251696 \\
 \times 9 \\
 \hline
 1732652640000
 \end{array}$$

EXAMPLES.

1. Required the product of 51307298 and 56, or 7 times 8.
Anf. 2873208688.
 2. What is the product of 31704592 and 36?
Anf. 1141365312.
 3. What is the product of 29753804 and 72?
Anf. 2142273888.
 4. What is the product of 7128368 and 96?
Anf. 684323328.
 5. What is the product of 61835720 and 1320?
Anf. 81623150400.
- IV. When

IV. When some of the figures of the multiplier may be produced by multiplying some others of them by any number, it is much easier and more concise, after having obtained the product of the less, to multiply that product by the same number for the product of the greater, than to proceed by the common method.

Note, this holds as well when the less numbers are on the left as when they are on the right of the greater; for, by the general rule, the products of the figures of the multiplier may be taken in any order. So in the 1st of the following examples first multiply by the 3, and then its product by 3 again for the product of 9, because 3 times 3 are 9.—In the second example, 1st multiply by the 4, and then double its product for the product of 8, because 2 times 4 are 8. In the 3d example, 1st multiply by the right hand 8, then 6 times its product will be the product of 48 the next two figures, and again 2 times this last will be the product for 96, the other two figures; so that there are only three lines of products to add up.—In the 4th example, first multiply by the 5 on the left hand, then 5 times its product will be the product for the 25 on the right of it, and 3 times this last will be the product for the remaining 75, because 3 times 25 are 75.—And in the 5th example, begin with the 3 in the middle then 9 times its product will be the product for the 27 on the left, and again 2 times this last will be the product for the 54 on the right. So that none of these examples have more than three lines of products.—But in operating this way, be careful to attend to the general rule of placing the 1st figure of each product straight below the 1st figure of its own multiplier:

The operation for the 5th or last example is here annexed.

$$\begin{array}{r}
 71380164 \\
 27354 \\
 \hline
 214140492.. \\
 1927264428... \\
 3854528856 \\
 \hline
 1952533006056
 \end{array}$$

1. Multiply 35802916 by 93. - - Anf. 3329671188.
2. Required the product of 910738060 and 48.
Anf. 43715426880.
3. What is the product of 61370913 and 96488?
Anf. 5921556653544.
4. What is the product of 13861470 and 52575?
Anf. 728766785250.
5. What is the product of 71380164 and 27354?
Anf. 1952533006056.

SIMPLE DIVISION.

SIMPLE Division is the finding how often one simple number is contained in another; or the dividing of any given simple number into any proposed number of equal parts.

The containing number, or number to be divided, is called the *dividend*.

The contained number, or the number of parts into which the dividend is divided, is called the *divisor*.

The

The number of times the dividend contains the divisor, or the number which expresses one of the equal parts, is called the *quotient*, thus:

Dividend.

Divisor 3) 12 (4 Quotient

Note, Division is a compendious subtraction, the quotient being the number of subtractions in the operation.

Simple division may be performed by the following

R U L E.

1. Having written down the divisor and dividend in the form above, consider if the divisor be less than, or equal to, the same number of the left-hand figures of the dividend; if so, write the figure expressing the number of times it is contained, in the quotient, but if not, take one place more of the dividend figures than are in the divisor. and write the number of times they contain it in the quotient as before.

2. Multiply the divisor by the quotient figure.

3. Subtract the product from the said dividend figures.

4. To the remainder affix the next dividend figure, and write in the quotient the number of times the divisor is contained in this number; multiply the divisor by the last quotient figure, and subtract the product from the last mentioned number; then proceed as before from the beginning of this article, till all the dividend figures are used.

Note 1. It is sometimes troublesome to find how often the divisor is contained in the several dividuals; but part of the trouble will be saved by observing, that when any product exceeds its dividual, the quotient figure belonging to such product must be lessened till the product be equal to, or less than its dividual; again, if, after subtracting the product from its dividual, the remainder be equal to, or exceed the divisor; the quotient figure must be increased till the remainder be less than it.

2. To complete the quotient, put the last remainder (if any) at the end of it, above a small line with the divisor below it.

To prove Division.

Multiply the quotient by the divisor, to the product add the remainder, and the sum will be equal to the dividend when the work is right.

E X A M P L E S.

1. Divide 73146085 by 4. - - - Anf 18286521 $\frac{1}{4}$.

2. What is the quotient of 5317986027 divided by 7?

Anf. 759712289 $\frac{3}{7}$

3. What is the quotient of 570196382 by 12?

Anf. 47516365 $\frac{1}{3}$

4. How

SIMPLE DIVISION.

27

4. How often is 37 contained in 74638105?
 Anf. 2017246 $\frac{3}{7}$ times.
5. How often does 137896254 contain 97?
 Anf. 1421610 $\frac{84}{97}$ times.
6. Divide 35821649 into 764 equal parts.
 Anf. They are equal 46886 $\frac{745}{764}$.
7. What is the quotient of 72091365 by 5201?
 Anf. 13861 $\frac{304}{5201}$.

CONTRACTIONS.

I. Division by a single figure, or by any figure in the first line of the multiplication table, may be expeditiously performed by multiplying and subtracting mentally, and writing down only the quotient below the dividend.

EXAMPLES.

3) 56103961	4) 52019675
<u>18701320$\frac{1}{3}$</u>	<u> </u>
Quotient	
5) 1370192	6) 38072940
<u> </u>	<u> </u>
7) 81390627	8) 23718620
<u> </u>	<u> </u>
9) 4308196	10) 7803196
<u> </u>	<u> </u>
11) 5701423	12) 2798313
<u> </u>	<u> </u>

II. When the divisor has ciphers on the right of it, you may strike them off, and divide without them; but the same number of figures must be struck off from the right of the dividend, and affixed to the last remainder.

EXAMPLES.

2,0) 370419,6	12,00) 718306,15
<u> </u>	<u> </u>

Divide 3108690170 by 7100. - - Anf. 437843 $\frac{4870}{7100}$.
 What

What is the quotient of 7380964 by 23000?

Ans. $320\frac{10964}{23000}$.

What is the quotient of 2304109 by 5800? Ans. $397\frac{1509}{5800}$.

III. Hence to divide by 1 with any number of ciphers annexed, you need only strike off from the right of the dividend so many figures as the divisor contains ciphers; which figures so struck off will be the remainder, and those on the left the quotient.

EXAMPLES.

5138602 divided by 100 is equal to $51386\frac{2}{100}$.

2701483 by 1000 is

3702140 by 100 is

IV. When the divisor is the product of two or more small numbers, it is much easier to divide continually by those numbers, than by the whole divisor at once.

Note. If there be any remainders after such divisions, multiply the last remainder by the preceding divisor, and to the product add the remainder belonging to the same divisor; then multiply the sum by the next preceding divisor, and to the product add its corresponding remainder; proceed in the same manner through all the divisors and remainders; so shall the last sum be the remainder, the same as if the division had been performed at once.

After the operation described in this note is begun, it must be continued according to the description, though some of the preceding divisions should happen to have no remainders,

So to divide 42901685 by 96 whose component parts are 8 and 12; divide the first by 8, and this quotient by the 12, and the remainders are 5 and 6; then 6 times 8 are 48, to which add the 5, and the sum 53 is the whole remainder to the whole divisor 96.

8) 42901685
12) 5362710 $\frac{5}{8}$
Quotient 446182 $\frac{53}{96}$

EXAMPLES.

1. Divide 31046835 by 56, or 7 times 8.

Quot. 554407 $\frac{43}{56}$.

2. Divide 7014596 by 72. - - -

Quot. 97424 $\frac{76}{72}$.

3. Divide 5130652 by 132. - - -

Quot. 38868 $\frac{76}{132}$.

4. Divide 83016572 by 240. - - -

Quot. 345902 $\frac{92}{240}$.

V. When you are pretty ready in Division, you may, even in the largest divisions, subtract each figure of the product as you produce it, and write down only the remainders.

EXAMPLES.

REDUCTION.

19

EXAMPLE.

1. Divide 3104679 by 833.

$$\begin{array}{r} 833 \overline{) 3104679} \quad (3727 \frac{88}{833} \\ 6056 \\ \hline 2257 \\ 5919 \\ \hline 88 \end{array}$$

2. Divide 79165238 by 238. - - - Quot. 332627 $\frac{12}{238}$.

3. Divide 29137062 by 5317. - - - Quot. 5479 $\frac{219}{5317}$.

4. Divide 62015735 by 7803. - - - Quot. 7947 $\frac{194}{7803}$.

REDUCTION.

REDUCTION is the conversion of numbers from one name to another, but still retaining the same value.

If the reduction be to a less name, it is commonly called *reduction descending*; but if to a greater, *reduction ascending*.

RULE.

Consider how many of the less name concerned make 1 of the greater, and by that number multiply the given number if the reduction be descending, but divide if ascending, and the product or quotient will be the value in the other name.

Note. 1. When there are names between the proposed and required ones, it is best to reduce the proposed to the next less or greater name, and this to the next less or greater again, and so on, till you have reduced it to the name required.

2. When, in reduction descending, the proposed is a compound number, you must add, or take in the small numbers in the names below the greatest, to the same names, as you proceed in the reduction.

3. When, in reduction ascending, you have any remainders after dividing, they will have the same names as their respective dividends, and may be placed after the last quotient, according to the order of their names, the greatest first; so shall the compound number thus formed be the answer.

OF MONEY.

Farthings	Pence	Shillings	Pound
4	1	1	1
48	12	1	1
960	240	20	1

Note. 1. This and the following tables are to be understood thus: The words at the top are the names of all the numbers straight below them; and

all the numbers upon the same line, from right to left, are of equal value: thus in the last line of this table, 960 farth. 240 pence, 20 shill. and 1 pound are all equal to each other.

2. 1 dec.

REDUCTION.

2. l denotes pounds, s shillings, and d denotes pence.
3. $\frac{1}{4}$ denotes 1 farthing or one quarter of any thing.
- $\frac{1}{2}$ - - - a half-penny, or a half of any thing.
- $\frac{3}{4}$ - - - 3 farthings, or 3 quarters of any thing.
4. The full weight and value of our gold and silver coin is as here below :

GOLD.		Value.			Weight.		SILVER.		Value.		Weight.	
		l	s	d	dwt	gr			s	d	dwt	gr.
A guinea		1	1	0	5	9½	A crown		5	0	19	8½
Half-guinea		0	10	6	2	16½	Half-crown		2	6	9	16¼
Quarter-guinea		0	5	3	1	8¼	Shilling		1	0	3	21
							Sixpence		0	6	1	22½

The value of gold is nearly 4l. an ounce, or 2d. a grain; and silver is nearly 5s. an ounce. Also any quantity of gold is to the same weight of standard silver, in the proportion of 15 and 1-14th to 1, or nearly 15 to 1.

EXAMPLES.

1. How many shillings and pence are in 23l. ?
Ans. 460s. or 5520d.
2. Reduce 5520 pence into shillings and pounds.
Ans. 460s. or 23l.
3. Reduce 35l. 13s. $0\frac{3}{4}$ d. to farthings.
Ans. 337587 farthings.
4. How many pounds, &c. are in 337587 farthings ?
Ans. 35l. 13s. $0\frac{3}{4}$ d.
5. In 35 guineas how many farthings ?
Ans. 35280 farthings.
6. In 35280 farthings how many guineas ?
Ans. 35 guineas.
7. How many crowns, shillings, groats, and pence, are in 50 pounds ?
Ans. 200 cr. 1000s. 3000 gr. 12000 d.
8. Reduce 12000 pence to groats, shillings, crowns and pounds.
Ans. 3000 gr. 1000s. 200 cr. 50l.

OF TROY WEIGHT.

Grains	Pennyweights	Ounces	Pound
24	1		
480	20	1	
5760	240	12	1

Note. By this weight are weighed jewels, gold, silver, corn, bread, and liquors. One grain of Troy weight is equal to one

grain and a half of sound dry wheat.

EXAMPLES.

1. How many ounces, pennyweights, and grains, are in 37lb. - - - Ans. 444 oz. 8880 dwts. 213120 grs.
2. Reduce 213120 grains to lb. - - - Ans. 37lb.
3. In

REDUCTION.

21

3. In 59 lb. 13 dwt. 5 gr. how many grains?

Ans. 340157 grs.

4. In 340157 grains, how many lbs. &c. &c.

Ans. 59 lb. 13 dwts. 5 gr.

OF APOTHECARIES WEIGHT.

Grains	Scruples			
20	1	Drams		
60	3	1	Ounces	
480	24	8	1	Pound
5760	288	96	12	1

Note. This weight is so called, because the apothecaries use it in compounding their medicines; but they buy and sell their drugs by avoirdupois weight. Apothecaries is the same as troy weight, having only some different divisions.

EXAMPLES.

1. In 17 lb. how many ounces, drams, and scruples?

Ans. 204 oz. 1632 dr. 4896 scr.

2. How many lbs. are in 4896 scruples? - - Ans. 17 lb.

3. In 231 lb. 3 oz. and 5 grs. how many grains?

Ans. 1332005 grs.

4. In 1332005 grains, how many lb.

Ans. 231 lb. 3 oz. 5 grs.

OF AVOIRDUPOISE WEIGHT.

Drams	Ounces				
16	1	Pounds			
256	16	1	Quarters		
7168	448	28	1	Hundreds	
28672	1792	112	4	1	Ton
573440	35840	2240	80	20	1

Note. By this weight are weighed all things of a coarse or drossy nature; such as grocery and chandlers wares, and all metals except gold and silver.

Note also, 1 lb. Avoirdupois makes 14 oz. 11 dwt. 15½ gr. Troy,

1 oz. - - - - - 0 18 5½
1 dr. - - - - - 0 1 3½

EXAMPLES.

1. In 15 tons, how many c. qrs. and lbs.?

Ans. 300 c. 1200 qrs. 33600 lb.

2. Reduce 33600 lb. to tons? - - Ans. 15 tons.

3. In 9 c. 5 lb. how many ounces? - - Ans. 16208 oz.

4. How many c. are in 16208 oz.? - - Ans. 9 c. 5 lb.

5. In 35 ton. 17 c. 1 qr. 23 lb. 7 oz. 13 dr. how many drams? - - - - - Ans. 20571005 dr.

6. Re-

REDUCTION.

6. Reduce 20571005 drams to tons.

Ans. 35 t. 17 c. 1 qr. 23 lb. 7 oz. 13 dr.

OF LONG MEASURE.

Inches	Feet	Yards	Poles	Furlongs	Mile
12	1				
36	3	1			
198	16½	5½	1		
7920	660	220	40	1	
63360	5280	1760	320	8	1

Note. An inch is supposed equal to 3 barley corns in length.

4 inch.—a hand.

6 feet, or 2 yards—a fathom.

3 miles—a league.

60 nautical or geographical miles—a degree, or $69\frac{1}{2}$ statute miles nearly.

Also 360 degrees, or 25000 miles nearly, is the circumference of the earth.

EXAMPLES.

1. How many inches are between London and Newcastle, or in 273 miles? - - - - - Ans. 17297280 inch.

2. In 17297280 inches, how many miles?

Ans. 273 miles.

3. Reduce 5 mls. 6 furl. 3 yds. into inches.

Ans. 364428 inch.

4. In 364428 inches how many miles?

Ans. 5 mls. 6 furl. 3 yds.

5. Reduce 2 mls. 1 furl. 8 pls. 3 yds. 2 inc. into inches.

Ans. 136334 inch.

6. In 136334 inches, how many miles, &c.

Ans. 2 mls. 1 furl. 8 pls. 3 yds. 2 inch;

OF CLOTH MEASURE.

Inches	Nails	Quarters	Yard
2½	1		
9	4	1	
36	16	4	1

Note, 3 qrs. = 1 ell Flemish.

5 — — English.

6 — — French.

4 qrs. 1½ inch Scotch.

EXAMPLES.

1. In 37 yds. how many qrs. and nails?

Ans. 148 qrs. 592 nails.

2. How

REDUCTION.

23

2. How many yds. are in 592 nails? - - Anf. 37 yds.
3. Reduce 15 yds. 3 qrs. 1 nl. to nails. - Anf. 253 nails.
4. How many yds. are in 253 nails?
Anf. 15 yds. 3 qrs. 1 nl.
5. In 73 ells Flemish, how many qrs. - - Anf. 219 qrs.
6. How many ells Flem. are in 219 qrs. Anf. 73 ells Fl.
7. Reduce 17 ells Eng. 3 qrs. to nails. - - Anf. 352 nls.
8. In 352 nails, how many ells Eng.
Anf. 17 ells Eng. 3 qr.

OF SQUARE OR LAND MEASURE.

Square inch.	Sqr. feet				
144	1	Sqr. yards			
1296	9	1	Sqr. poles		
39204	272 $\frac{1}{4}$	30 $\frac{1}{4}$	1	Roods	
1568160	17890	1210	40	1	Acre
6272640	43560	4840	160	4	1

EXAMPLES.

1. In 15 acres, how many poles? - - Anf. 2400 poles.
2. How many acres are in 2400 poles? - Anf. 15 acres.
3. Reduce 27 a. 1 r. 32 p. into poles. Anf. 4392 poles.
4. Reduce 4392 poles into acres. - Anf. 27 a. 1 r. 32 p.

OF WINE MEASURE.

Pints	Gallons					
8	1	Tierces				
336	42	1	Hhds.			
504	63	1 $\frac{1}{2}$	1	Punch.		
672	84	2	1 $\frac{2}{3}$	1	Pipe or But	
1008	126	3	2	1 $\frac{1}{2}$	1	Tun
2016	252	6	4	3	2	1

Note, 231 cubick inch.—a gallon.

10 gall.—an anchor.

18 gall.—a rundlet.

31 $\frac{1}{2}$ gall.—a barrel.

By this measure, wines brandies, spirits, perry, cyder, mead, vinegar, oil, and honey are measured:

EXAMPLES.

REDUCTION.

1. In 19 hhd. of wine, how many pints? Ans. 9576 pints.
2. How many hhd. are in 9576 pints of wine?
Ans. 19 hhd.
3. Reduce 13 tuns. 1 pipe, 1 hhd. 17 gall. 5 pts. to pints.
Ans. 27861 pts.
4. Reduce 27861 pints to tuns.
Ans. 13 tuns, 1 pipe, 1 hhd. 17 gall. 5 pints.

OF ALE AND BEER MEASURE.

Pints	Gallons				
8	1	Firk.			
68	$8\frac{1}{2}$	1	Kilderk.		
136	17	2	1	Bar.	
272	34	4	2	1	Hhd.
408	51	6	3	$1\frac{1}{2}$	1

Note, The ale gallon contains 282 cubic inches.

In London, the ale firkin contains 8 gall. and the beer firkin 9; the other measures above it being decreased and increased in the same proportion.

EXAMPLES.

1. In 13 hhd. of ale, how many gallons? - Ans. 663 gall.
2. How many hhd. are in 663 gallons of ale? Ans. 13 hhd.
3. How many pints are in 1 bar. 1 fir, 3 pints of ale?
Ans. 343 pints.
4. Reduce 343 pints of ale to barrels.
Ans. 1 bar. 1 fir. 3 pts.

OF DRY MEASURE.

Pints	Gall.						
8	1	Pecks					
16	2	1	Bush.				
64	8	4	1	Combs			
256	32	16	4	1	Quar.		
512	64	32	8	2	1	Weys	
2560	320	160	40	10	5	1	Last
5120	640	320	80	20	10	2	1

Note,

COMPOUND ADDITION.

Note. The gallon dry measure, contains $268\frac{4}{5}$ cubic inches. At London 36 bushels of coals make a chaldron. A bushel water measure is 5 pecks.

By dry measure all dry wares, such as corn, seeds, fruits, roots, sand, salt, coals, oysters, muscles, cockles, &c. are measured.

EXAMPLES.

1. In 128 qrs. how many pecks? - Ans. 4096 pecks.
2. How many qrs. are in 4096 pecks? - Ans. 128 qrs.
3. In 3 lasts, 5 qrs. 3 bush. how many gallons? Ans. 2264 gal.
4. Reduce 2264 gallons to lasts. Ans. 3 ls. 5 qrs. 3 bush.

Of TIME.

Minutes	Hours			
60	1	Days		
1440	24	1	Weeks	
10080	168	7	1	Month
40320	672	28	4	

Note, The minute is divided into 60 seconds, and the second may be supposed to be divided into 60 thirds, and these again into 60 fourths, &c.

EXAMPLES.

1. How many minutes are in 1763 months?
Ans. 71084160 min.
2. In 71084160 minutes, how many months?
Ans. 1763 months.
3. How many seconds are in a solar year, or 365 ds.
5 hrs. 48 min. 58 sec. - - - - - Ans. 31556938 sec.
4. In 31556938 seconds, how many days, &c.
Ans. 365 ds. 5 hrs. 48 min. 58 sec.
5. In a lunar month, or 29 ds. 12 hrs. 45 min. how many seconds?
Ans. 2551500 sec.
6. Reduce 2551500 seconds to days.
Ans. 29 ds. 12 hrs. 45 min.

COMPOUND ADDITION.

COMPOUND Addition is the finding the sum of several compound numbers.

R U L E.

1. Place the numbers of the same denomination under each other according to the directions given in simple addition.

B

2. Add

Laft

1

Note,

COMPOUND ADDITION.

2. Add up the figures in the lowest denomination as in simple addition.

3. Find how many units of the next higher denomination are contained in the sum, by dividing it by so many as of this name make one of the next, or any other way.

4. Write the remainder or overplus underneath, and carry the ones or units to the figures in the next denomination, whose sum you must find and proceed with as before; and so on, through all the denominations to the highest, whose sum must be all written down, which together with the several remainders, will express the total required.

Note, Addition of money may be performed by the general rule, or by the help of the following

PENCE TABLES.

d		s	d		s		d
20	—	1	8		2	—	24
30	—	2	6		3	—	36
40	—	3	4		4	—	48
50	—	4	2		5	—	60
60	—	5	0		6	—	72
70	—	5	10		7	—	84
80	—	6	8		8	—	96
90	—	7	6		9	—	108
100	—	8	4		10	—	120
110	—	9	2		11	—	132
120	—	10	0		12	—	144

EXAMPLES of MONEY.

l	s	d	l	s	d	l	s	d	l	s	d
7	13	3	14	7	5	15	17	10	53	14	8
3	5	$10\frac{1}{2}$	8	19	$2\frac{3}{4}$	3	14	6	5	10	$2\frac{3}{4}$
6	18	7	5	3	$4\frac{1}{2}$	23	6	$2\frac{3}{4}$	93	11	6
0	2	$5\frac{3}{4}$	21	2	9	8	3	5	7	5	0
4	0	3	7	16	$8\frac{1}{2}$	15	6	4	2	0	9
17	15	$4\frac{1}{2}$	0	4	3	6	12	$9\frac{1}{4}$	0	18	7
<hr/>			<hr/>			<hr/>			<hr/>		
<hr/>			<hr/>			<hr/>			<hr/>		

COMPOUND ADDITION.

27

l	s	d	l	s	d	l	s	d	l	s	d
14	0	7 $\frac{1}{4}$	37	15	8	61	3	2 $\frac{1}{2}$	472	15	3
5	13	6	14	12	9 $\frac{1}{4}$	7	16	8	9	2	2 $\frac{1}{2}$
62	4	7	5	6	11	29	13	10 $\frac{3}{4}$	27	12	6 $\frac{1}{4}$
4	17	8	23	10	9 $\frac{1}{4}$	8	14	0	370	16	2 $\frac{1}{2}$
23	0	4 $\frac{3}{4}$	8	6	0	0	7	5 $\frac{1}{4}$	25	3	8
6	6	7	14	0	5 $\frac{1}{2}$	24	13	0	6	10	5 $\frac{1}{4}$
91	0	10 $\frac{1}{4}$	54	2	7 $\frac{1}{2}$	5	0	10 $\frac{3}{4}$	30	0	11 $\frac{1}{4}$

Suppose that A is indebted to B, 34l. 13s. 7d. to C, 173ol. to D, 9l. 19s. 2d. to E, 134l. 7d. to F, 17s. 2d. and to G 9d. what is A's whole debt? Ans. 1909l. 11s. 3d.

Suppose that B owes A 75l. 17s. C owes 15s. 5d. D owes 21l. 13s. 6 $\frac{1}{2}$ d. E owes 9d $\frac{1}{2}$ F owes 796l. 3d. and G owes 17l. 13s. 10d. what is due to A by all of them?

Ans. 912l. 0s. 10d.

A owes to B, for tea, 13l. 10s. for cheese, 17l. 13s 5d. for cotton, 208l. 17s. for Indian chintz, 86l. 7d. for his acceptance of a bill, 300l. for factorage, 15l. 17s. 3 $\frac{1}{4}$ d. also for insurance and other charges, 30l. 10s. 4 $\frac{1}{2}$ d. how much is A's whole debt to B?

Ans. 672l. 8s. 8 $\frac{1}{4}$ d.

A corn-factor pays for wheat, 37l. 15s. 8d. for rye, 11l. 16s. 3d. for oats, 96l. 7 $\frac{1}{2}$ d. for barley, 53l. 12s. also for peas and beans, 10l. he has also paid for carriage and other petty charges, 3l. 17s. 5 $\frac{3}{4}$ d. and for insurance, 11l. 3 $\frac{3}{4}$ d. now suppose that his commission on the whole is 7l. 3s. 0 $\frac{1}{2}$ d. for how much must he draw upon his employer to clear the account?

Ans. 231l. 5s. 4 $\frac{1}{2}$ d.

A nobleman, going out of town, is informed by his steward, that his butcher's bill comes to 197l. 13s. 7 $\frac{1}{2}$ d. his baker's to 59l. 5s. 2 $\frac{3}{4}$ d. his brewer's to 85l. his wine-merchant's to 103l. 13s. to his lordship's corn-chandler is due 75l. 3d. to his tallow-chandler and cheese-monger, 27l. 15s. 11 $\frac{1}{4}$ d. and to his tailor, 55l. 3s. 5 $\frac{3}{4}$ d. also for rent, servants wages, and other charges, 127l. 3s. now supposing he would take 100l. with him to defray his charges on the road, for what sum must he send to his banker?

Ans. 830l. 14s. 6 $\frac{1}{4}$ d.

COMPOUND ADDITION.

EXAMPLES of WEIGHTS, MEASURES, &c.

TROY WEIGHT.

lb	oz	dwt	oz	dwt	gr
17	3	15	37	9	3
4	6	3	9	5	3
0	10	7	3	16	21
9	5	0	17	7	8
176	2	17	5	9	0
23	11	12	3	0	19

APOTHECARIES WEIGHT.

lb	oz	dr	sc	oz	dr	sc	gr
3	5	7	2	3	5	1	17
13	7	3	0	7	3	2	5
9	11	0	1	16	7	0	12
0	9	1	2	9	5	1	5
36	3	5	0	4	1	2	18
5	8	6	1	36	4	1	14

AVOIRDUPOIS WEIGHT.

lb	oz	dr	cwt	qr	lb
17	10	13	15	2	15
5	14	8	6	3	24
8	6	15	7	0	10
27	1	6	9	1	17
0	4	0	10	2	6
6	14	10	3	0	3

LONG MEASURE.

mls	fur	pls	yds	feet	inc
29	3	14	127	1	5
19	6	29	12	2	9
5	4	20	0	2	6
9	1	37	54	1	11
7	0	3	5	2	7
4	5	9	23	0	5

CLOTH MEASURE.

yds	qr	nls	el	en	qrs	nls
26	3	1	270	1	0	
13	1	2	57	4	3	
6	2	0	8	2	1	
217	0	3	0	3	2	
9	1	0	10	1	0	
55	3	1	4	4	1	

LAND MEASURE.

ac	ro	p	ac	ro	p
225	3	37	19	0	16
16	1	25	270	3	29
9	0	13	9	1	3
4	2	9	23	0	34
42	1	19	7	2	16
7	0	6	75	0	23

WINE MEASURE.

T	hds	gal	hhds	gal	pts
13	3	15	15	61	5
8	1	37	7	16	3
4	2	26	29	23	7
25	0	12	3	15	1
3	1	9	16	8	0
72	3	21	4	36	6

ALE and BEER MEASURE.

hds	gal	pts	hds	gal	pts
17	37	3	29	43	5
4	13	5	7	9	2
3	6	2	14	16	6
5	14	0	6	8	1
12	9	6	57	13	4
8	42	4	5	6	0

DRY MEASURE.

TIME.

L	qr	bu	qr	bu	pe	mo	we	da	hrs	m	s
13	5	2	25	7	3	17	3	4	27	15	37
7	1	3	5	3	1	26	1	6	12	26	14
41	7	4	17	5	2	7	0	2	3	7	16
3	0	7	6	2	3	19	2	3	35	42	59
24	3	0	33	0	2	8	3	0	6	9	4
5	2	1	7	4	1	12	1	6	31	16	32

A gentleman bought of a silver-smith, dishes to the weight of 23 lb. 6 oz. 5 dwt. plates 41 lb. 7 oz. 17 dwt. spoons 12 lb. 15 dwt. salts 2 lb. 7 oz. waiters 13 lb. and tankards 7 lb. 17 dwt. What weight of plate did he buy in all? — Ans. 99 lb. 10 oz. 14 dwt.

An apothecary made a composition of 5 ingredients, the 1st of which weighed 13 lb. 7 oz. the 2d, 11 oz. 7 dr. 13 gr. the 3d, 7 lb. 2 scr. the 4th, 11 lb. 3 dr. 1 scr. and the 5th weighed 15 lb. 5 oz. 7 gr. What was the weight of the whole? — Ans. 48 lb. 3 dr. 1 scr.

A country shopkeeper buys of a merchant in London teas weighing 3 qrs. 14 lb. coffee, 1 qr. 23 lb. sugars, 3 cwt. 2 qr. 5 lb. spices, 2 qr. 3 lb. 13 oz. hops, 13 cwt. 1 qr. 24 lb. and several other things to the weight of 3 cwt. 17 lb. 7 oz. For what weight has he to pay carriage on bringing them home? — Ans. 22 cwt. 3 lb. 4 oz.

From A to B is 3 mls. 2 fur. 7 pls. from B to C is 17 mls. 13 pls. from C to D is 7 fur. and from D to E is 5 mls. 33 pls. What is the distance between A and E? — Ans. 26 mls. 2 fur. 13 pls.

Bought four parcels of cloth, the 1st of which contains 25 yds. 3 qr. the 2d, 37 yds. 2 qr. 3 nls. the 3d, 14 yds. 1 n. and the 4th, 23 yds. How many yards are in them all? — Ans. 100 yds. 2 qrs.

There are five pieces of ground, the 1st of which measures 13 ac. 3 r. 14 p. the 2d, 27 ac. 29 p. the 3d, 19 ac. 1 r. the 4th, 3 r. 34 p. and the 5th, 45 ac. 2 r. 11 p. What is the sum of their measures? — Ans. 106 ac. 3 ro. 8 p.

A gentleman bought of a wine-merchant, of port wine 1 tun, 3 hhd. of claret 3 hhd. 47 gal. of mountain 1 hhd. B 3 5 gal.

5 gal. and of Lisbon, 2 hhds. 23 gal. What quantity did he buy in all ? Ans. 3 tu. 2 hhd. 12 gal.

A beer-brewer has sent into the country, ale, as follows, viz. at one time 3 hhds. 14 gal. at another 2 hhds. 17 gal. at another 14 hhds. 27 gal. and at another 5 hhds. 47 gal. How much was sent at all the times ?

Ans. 26 hhds. 3 gal.

A corn-merchant sends over the sea, of wheat 13 lasts, 3 qr. 5 bush. of oats 29 lfts. 7 qr. of rye he has sent 3 lfts. 7 bush. of peas 8 qrs. 3 bush. and of beans 5 qr. For what has he freight to pay ?

Ans. 47 lfts. 4 qr. 7 bush.

When B was born, A's age was 113 mths. 2 wks. when C was born, B's age was 97 mo. 1 we. 5 ds. when D was born, C's age was 107 mo. 3 ds. 14 hs. and when E was born, D's age was 75 mo. 3 we. 19 hs. What was A's age when E. was born ?

Ans. 393 mon. 3 we. 2 ds. 9 hs.

COMPOUND SUBTRACTION.

COMPOUND Subtraction is the finding the difference between two numbers, of which one or both are compound.

R U L E.

1. Write the less number under the greater, as directed in compound addition.
2. Then, beginning at the least denomination, subtract the under number of each from the upper, writing their respective remainders below them.
3. But if the under number of any of the denominations be greater than the upper, add so many to the upper as make one of the next higher denomination; then take the under from the sum, writing down the remainder as before, and carry or add one to the under number of the next higher denomination before you subtract it.

E K.

COMPOUND SUBTRACTION.

34

EXAMPLES of MONEY.

	l	s	d	l	s	d	l	s	d	l	s	d
From	79	17	8 $\frac{1}{2}$	103	3	2 $\frac{1}{2}$	57	10	10	251	13	0
Take	35	12	4 $\frac{1}{4}$	71	12	5 $\frac{3}{4}$	29	13	3 $\frac{1}{4}$	35	14	7 $\frac{1}{2}$
Rem.												
Proof												

What is the difference between 73l. 5 $\frac{1}{2}$ d. and 19l. 13s. 10d. — — — — — Ans. 53l. 6s. 7 $\frac{1}{4}$ d.

A lends to B 100l. how much is B in his debt, after A has taken goods of him to the amount of 73l. 12s. 4 $\frac{1}{4}$ d.

Ans. 26l. 7s. 7 $\frac{1}{4}$ d.

Suppose that my rent for half a year is 10l. 12s. and that I have laid out for the land-tax, 14s. 6d. and for several repairs, 1l. 3s. 3 $\frac{1}{4}$ d. what have I to pay of my half year's rent? — — — — — Ans. 8l. 14s. 2 $\frac{1}{2}$ d.

A trader, failing, owes to A, 35l. 7s. 6d. to B, 91l. 13s. $\frac{1}{2}$ d. to C, 53l. 7 $\frac{1}{4}$ d. to D, 87l. 5s. and to E. 111l. 3s. 5 $\frac{1}{2}$ d. When this happened, he had by him in cash, 23l. 7s. 5d. in wares, 53l. 11s. 10 $\frac{1}{4}$ d. in household furniture, 63l. 17s. 7 $\frac{3}{4}$ d. and in recoverable book debts, 25l. 7s. 5d. What will his creditors lose by him, suppose these things delivered to them?

Ans. 212l. 5s. 6 $\frac{1}{2}$ d.

EXAMPLES of WEIGHTS, MEASURES, &c.

TROY WEIGHT.

APOTHECARIES WEIGHT.

	lb	oz	dwt	gr	lb	oz	dwt	gr	lb	oz	dr	scr	gr
From	7	3	14	11	4	9	1	13	73	4	7	0	14
Take	3	7	5	19	3	7	16	12	26	7	2	1	16
Rem.													
Proof													

COMPOUND SUBTRACTION.

AVOIRDUPOIS WEIGHT.

	c	qrs	lb	lb	oz	dr
From	5	0	17	71	5	9
Take	3	2	11	14	6	14
Rem.						
Proof						

LONG MEASURE.

	m	fu	pl	yd	ft	in
	14	3	17	96	1	4
	3	7	9	41	2	7

CLOTH MEASURE.

	yd	qr	nl	yd	qr	nl
From	17	2	1	9	0	2
Take	5	2	1	6	1	2
Rem.						
Proof						

LAND MEASURE.

	ac	ro	p	ac	ro	p
	17	1	14	57	1	16
	9	3	6	24	2	25

WINE MEASURE.

	t	hd	gal	hd	gal	pt
From	17	2	23	5	0	4
Take	4	3	39	3	2	7
Rem.						
Proof						

ALE and BEER MEASURE.

	hd	gal	pt	hd	gal	pt
	14	29	3	71	16	5
	7	34	5	17	3	2

DRY MEASURE.

	la	qr	bu	bu	gal	pt
From	9	4	7	13	7	1
Take	3	7	2	7	3	4
Rem.						
Proof						

TIME.

	mo	we	da	ds	hrs	min
	71	2	5	114	17	26
	14	3	0	75	12	33

COMPOUND MULTIPLICATION.

COMPOUND Multiplication is the finding of a number which shall contain a given compound number any proposed number of times.

R U L E.

1. Write the multiplier under the lowest denomination of the multiplicand.

2. Multiply the number of the lowest denomination by the multiplier, and find how many units of the next higher denomination are contained in the product, as in compound addition.

3. Write down the excess, and carry the ones to the product of the next higher denomination, with which proceed as before; and in like manner with all the other denominations to the highest.

I. EXAMPLES of MONEY.

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ \text{0} \quad 9 \quad 4\frac{3}{4} \\ \hline \quad 4 \end{array}$$

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ 1 \quad 17 \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ 2 \quad 14 \quad 6 \\ \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ 0 \quad 17 \quad 2\frac{3}{4} \\ \quad 10 \\ \hline \hline \end{array}$$

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ 7 \quad 9 \quad 8\frac{1}{4} \\ \hline \quad 5 \end{array}$$

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ 17 \quad 3 \quad 7\frac{1}{4} \\ \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ 5 \quad 0 \quad 10 \\ \quad 11 \\ \hline \hline \end{array}$$

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ 18 \quad 6 \quad 1\frac{1}{2} \\ \hline \quad 6 \end{array}$$

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ 6 \quad 12 \quad 6\frac{1}{2} \\ \quad 9 \\ \hline \end{array}$$

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ 2 \quad 6 \quad 0\frac{1}{4} \\ \quad 12 \\ \hline \hline \end{array}$$

II. EXAMPES of WEIGHTS, MEASURES, &c.

TROY WEIGHT.

lb	oz	dwt	gr
3	0	14	9
3			

AVOIRDUPOIS WEIGHT.

cwt	qr	lb
17	3	23
5		

LONG MEASURE.

miles	fur	poles
31	3	27
7		

CLOTH MEASURE.

yd	qr	nl
53	1	3.
9		

WINE MEASURE.

tuns	hds	gal
19	3	17
11		

hd fir pts

Mult. 3 5 47 by 18.

Ans. 71 hds. 30 pints.

las qrs bus

Mult. 5 3 7 by 72.

Ans. 387 laf. 9 qrs.

mon we da

Mult. 7 3 5 by 26.

Ans. 206 mo. 4 da.

cwt qr lb

Mult. 3 7 14 by 53.

Ans. 178 cwt. 3 qrs. 14lb.

APOTHECARIES WEIGHT.

lb	oz	dr	sc	gr
13	5	3	1	14
4				

AVOIRDUPOIS WEIGHT.

lb	oz	dr
21	11	15
6		

LONG MEASURE.

yd	feet	inc
171	1	10
8		

LAND MEASURE.

ac	ro	pol
15	2	29
10		

ALE MEASURE.

hds	gal	pin
53	33	3
12		

bar kild gal

Mult. 21 1 13 by 36.

Ans. 787 bar. 1 kil. 9 gal.

buf pec gal

Mult. 71 3 1 by 132.

Ans. 9487 bu. 2 pec.

days hrs min

Mult. 14 13 27 by 47.

Ans. 684 da. 8 hr. 9 m.

cwt lb

Mult. 17 12 by 75.

Ans. 1283 cwt. 4lb.

See

See more of compound multiplication under Rule I. of *Rules of Practice*.

COMPOUND DIVISION.

COMPOUND Division is the dividing compound numbers into any proposed number of equal parts.

R U L E.

1. Place the divisor and dividend as in simple division.
2. Begin at the highest denomination and divide each by the divisor, writing the quotients under their respective dividends.
3. But if there be a remainder after dividing any of the denominations except the least, you must find how many of the next lower denomination it is equal to, and add to it the small number (if any) which was in this denomination before; then divide the sum.

F. EXAMPLES of MONEY.

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ 3) \quad 1 \quad 8 \quad 6 \\ \hline \hline \end{array}$$

$$\begin{array}{r} 5) \quad 0 \quad 6 \quad 3 \\ \hline \hline \end{array}$$

$$\begin{array}{r} 7) \quad 0 \quad 11 \quad 11\frac{1}{2} \\ \hline \hline \end{array}$$

$$\begin{array}{r} 9) \quad 0 \quad 12 \quad 9 \\ \hline \hline \end{array}$$

$$\begin{array}{r} 11) \quad 19 \quad 10 \quad 6 \\ \hline \hline \end{array}$$

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ 4) \quad 1 \quad 10 \quad 8 \\ \hline \hline \end{array}$$

$$\begin{array}{r} 6) \quad 0 \quad 4 \quad 9 \\ \hline \hline \end{array}$$

$$\begin{array}{r} 8) \quad 1 \quad 1 \quad 0 \\ \hline \hline \end{array}$$

$$\begin{array}{r} 10) \quad 28 \quad 18 \quad 4 \\ \hline \hline \end{array}$$

$$\begin{array}{r} 12) \quad 40 \quad 8 \quad 0 \\ \hline \hline \end{array}$$

B 6

II. EXAM.

II. EXAMPLES of WEIGHTS, MEASURES, &c.

TROY WEIGHT.
lb oz dwt
4) 13 1 15 (

AVOIRDUROIS WEIGHT.
C qr lb
7) 75 1 12 (

LONG MEASURE.
miles fur pls
11) 58 5 12 (

CLOTH MEASURE.
yds qr nl
17) 31 2 3 (

APOTHECARIES WEIGHT.
lb oz dr sc gr
6) 2 5 3 0 19 (

AVOIRDUPOIS WEIGHT.
lb oz dr
9) 5 3 14 (

LONG MEASURE.
yds feet in
12) 150 1 7 (

LAND MEASURE.
ac ro pls
26) 17 3 17 (

See more of compound division under rule II. of *Rules of Practice*.

RULE-OF-THREE.

THE Rule-of-three is that by which a number is found having to a given number the same proportion which is between two other given numbers. For this reason it is sometimes named the *Rule of Proportion*.

It is called the Rule-of-Three, because in each of its questions there are given three numbers at least. And because of its excellent and extensive use, it is often named the *Golden Rule*.

For the stating, or rightly placing down the three given numbers, observe the following

R U L E.

1. Write down the number which is of the same kind with the answer or number required.

2. Consider whether the answer ought to be greater or less than this number; then write respectively the greater or less of the two remaining numbers on the right of it for the third, and the other on the left for the first number or term.

3. Multiply the 2d and 3d terms together, divide the product by the first, and the quotient will be the answer.

Note 1.

Note 1. When you can conveniently multiply and divide as in compound multiplication and division, it is best so to do.

2. But if not, reduce the compound terms to the lowest name mentioned in them, and the first and third to the same name if they be not so already; then will the answer be of the same name with the 2d term.

3. When there happens to be a remainder after division, reduce it to the name next below the last quotient, and divide by the same divisor, so shall the quotient be so many of the said next name; do this as long as there is any remainder, till you have reduced it to the least name, and all the quotients together will be the answer.

4. If the 1st term, and either the 2d or 3d can be divided by any number, without remainder, let them be divided, and the quotients used instead of them.

5. There are 4 other methods of operation besides the general one above delivered, any of which, when possible, performs the work much shorter than it. They are thus:

First, Divide the 2d term by the 1st, multiply the quotient by the 3d, and the product will be the answer.

Second, Divide the 3d term by the 1st, multiply the quotient by the 2d, and the product will be the answer.

Third, Divide the 1st term by the 2d, divide the 3d by the quotient, and the last quotient will be the answer.

Fourth, Divide the 1st term by the 3d, divide the 2d by the quotient, and the last quotient will be the answer.

For an example, let it be proposed to find the value of 14 oz. 8 dwt. of gold, at 3l. 19s. 11d. an ounce.

EXPLAN. Having stated the three terms by the general rule, as here annexed, the 2d term is reduced to pence, and the third to dwts. these being their lowest denominations, as directed in the 2d note. The 1st term is also reduced to dwts. that it may agree with the 3d by the same note. The 2d term is then multiplied by the 3d, and the product divided by the 1st, according to the general rule, when the answer comes out 13809 pence, and 12 remaining over; which remainder being reduced to farthings, and these divided by the same divisor 20, by the 3d note, the quotient is 2 farthings, and 8 remaining. Lastly, the pence are divided by 12 to reduce them to shillings, and these again by 20 for pounds; when the final sum comes out 57l. 10s. 9d. 2q. for the answer.

But this question will also serve to illustrate some more of the notes, by means of which it can be easier solved than by the general rule as above given; for having stated it as before, and as here again annexed, and reduced the 1st and 3d terms to dwts. divide them each by 4, and use the quotients 5 and 72 instead of them as by the 4th note; then multiply and divide, as directed in the 1st note, by compound multiplication and division, multiplying by 8 and 9 instead of 72, its component parts; after which the answer comes out the same as before, but with much less trouble.

Several of the following large collection of examples will afford occasions to illustrate the different parts of the 5th note as well as the other notes.

oz	l	s	d	oz dwt
1	:	3	19	11 :: 14 8 :
20		20		20
20		79		288
		12		
		959		
		288		
		7672		
		7672		
		1918		
2,0)	27619,2			
	13809 $\frac{1}{2}$	pence, or		
12)	13809d.	2 $\frac{8}{20}$ q.		
2,0)	115,0s.	9d. 2 $\frac{8}{20}$ q.		
	Ans. 57l. 10s. 9d. 2 $\frac{8}{20}$ q.			

oz	l	s	d	oz dwt
1	:	3	19	11 :: 14 8 :
20			8	20
4)20	31	19	4	4,288
	5		9	72
5)287	14	0		
	57l.	10s.	9d. 2 $\frac{8}{20}$ q.	

EXAMPLES.

EXAMPLES.

1. If 8 yards of cloth cost 24s. what will 96 yards cost
 Ans. 14l. 8s.
2. How many yards of cloth may be bought for 14l. 8s. when 8 yards cost 24s. - - - -
 Ans. 96 yds.
3. What will be the price of 72 yards of cambric, of which 9 yards cost 5l. 12s. - - - -
 Ans. 44l. 16s.
4. What will 9 yards of cambric cost, at the rate of 44l. 16s. for 72 yards? - - - -
 Ans. 5l. 12s.
5. If 7 cwt. 1 qr. of sugar cost 26l. 10s. 4d. what will be the price of 43 cwt. 2 qrs. - - - -
 Ans. 159l. 2s.
6. What quantity of sugar may be bought for 159l. 2s. at the rate of 7 cwt. 1 qr. for 26l. 10s. 4d.
 Ans. 43 cwt. 2 qrs.
7. How many yards of muslin may be bought for 44l. 16s. whereof 9 yards cost 5l. 12s. - - - -
 Ans. 72 yards.
8. How much must be paid for 26 bags of hops, at 21l. 4s. for 8 bags? - - - -
 Ans. 68l. 18s.
9. How many men must be employed to finish a piece of work in 15 days, which 5 men can do in 24 days?
 Ans. 8 men.
10. How many yards of broad cloth may be bought for 5l. 12s. of which 72 yards cost 44l. 16s. - - - -
 Ans. 9 yds.
11. What must be paid for 53 ells eng. 1 qr. of holland, at the rate of 7s 9½d. per yard? - - - -
 Ans. 25l. 18s. 1½d.
12. How many yards of matting, which is 2 feet 6 inches broad, will cover a floor which is 27 feet long and 20 broad? - - - -
 Ans. 216 feet or 72 yds.
13. What quantity of sugar may be bought for 26l. 10s. 4d. when the price of 43 cwt. 2 qr. is 159l. 2s.
 Ans. 7 cwt. 1 qr.
14. In how many days will 8 men finish a piece of work which 5 men can do in 24 days? - - - -
 Ans. 15 days.
15. What must be paid for 8 bags of hops, when the price of 26 bags is 68l. 18s. - - - -
 Ans. 21l. 4s.
16. A person failing in trade, owes in all, 977l. and has in money, goods, and recoverable debts, 420l. 6s. 3½d. supposing these things delivered to his creditors, what will they get per pound? - - - -
 Ans. 8s. 7½d.
17. What

17. What must be given for a piece of silver weighing 73 lb. 5 oz. 15 dwts. at the rate of 5s. 9d. per ounce?

Ans. 253l. 10s. 0 $\frac{1}{4}$ d.

18. Bought 3 casks of raisins, each weighing 3 cwt. 1 qr. 7 lb. neat, what will they cost at 2l. 6s. 6d. per cwt?

Ans. 23l. 2s. 1 $\frac{1}{8}$ d.

19. A garrison, being besieged, has 5 months provision in it, at the rate of 12 ounces a day for each man; but being informed that it cannot be relieved till after nine months, how much per day must each man have that the provisions may last that time? - - - - -

Ans. 6 $\frac{2}{3}$ ounces.

20. What will the tax upon 763l. 15s. be, at the rate of 3s. 6d. per pound? - - - - -

Ans. 133l. 13s. 1 $\frac{1}{2}$ d.

21. How much silver may I have for 253l. 10s. 0 $\frac{1}{4}$ d. at 5s. 9d. per ounce? - - - - -

Ans. 73 lb. 5 oz. 15 dwts.

22. What will 7 cwt. 1 qr. of sugar cost, at the rate of 43 cwt. 2 qr. for 159l. 2s. - - - - -

Ans. 26l. 10s. 4d.

23. What must be paid for 1 cwt. 3 qr. 17 lb. of wool, at 7s. 4d. the stone of 14 lb. - - - - -

Ans. 5l. 11s. 6d. 3 $\frac{1}{2}$ q.

24. What quantity of hops may be bought for 68l. 18s. of which 8 bags cost 21l. 4s. - - - - -

Ans. 26 bags.

25. How many ells eng. of holland may be bought for 25l. 18s. 1 $\frac{3}{4}$ d. at 7s. 9 $\frac{1}{2}$ d. per yard? - - - - -

Ans. 53 ells eng. 1 qr.

26. A person stopping payment, owes to several 977l. but compounds with them for 8s. 7 $\frac{1}{4}$ d. per pound; what must he pay them in all? - - - - -

Ans. 420l. 6s. 3 $\frac{1}{2}$ d.

27. A borrowed of B 730l. for 8 months; afterwards A would requite B's kindness by lending him 375l. required the time it must be lent. - - - - -

Ans. 15 mo. 2 we. 2 $\frac{2}{3}$ ds.

28. What will 1 qr. 1 nail of velvet cost, at 18s. 6d. per yard? - - - - -

Ans. 5s. 9d. 1 $\frac{3}{8}$ q.

29. What must be given for 7 c. 3 qr. 14 lb. of cheese, at 1l. 14s. 2d. per cwt. - - - - -

Ans. 13l. 9s. 0 $\frac{1}{4}$ d.

30. What is the price of 2 c. 1 qr. 12 lb. of beef, at 2s. 8d. per stone or 14 lb? - - - - -

Ans. 2l. 10s. 3d. 1 $\frac{1}{2}$ q.

31. A person, breaking, compounds with his creditors, for 8s. 7 $\frac{1}{4}$ d. per pound, and at that rate he pays them in all 420l. 6s. 3 $\frac{1}{2}$ d. What was his debt? - - - - -

Ans. 977l.

32. Bought 73 lb. 5 oz. 15 dwts. of silver for 253l. 10s. 0 $\frac{1}{4}$ d. What did it cost per ounce? - - - - -

Ans. 5s. 9d.

33. If the tax upon 763l. 15s. be 133l. 13s. 1 $\frac{1}{2}$ d. at what rate is it per pound? - - - - -

Ans. 3s. 6d. per l.

34. What

34. What must I pay for three-eighths of a ship, which is valued at 700l. - - - - - Ans. 262l. 10s.
35. What will the carriage of 8 c. 3 qrs. 7 lb. cost, at 10d. per stone? - - - - - Ans. 2l. 18s. 9d.
36. If the carriage of 5 c. 14 lb. for 96 miles be 1l. 12s. 6d. how far may I have 3 c. 1 qr. carried for the same money? - - - - - Ans. 151 m. 3 fur. $3\frac{1}{3}$ pol.
37. What cost 30 pieces of lead, each weighing 1 c. 12 lb. at the rate of 16s. 4d. per cwt. - - - - - Ans. 27l. 2s. 6d.
38. Bought a silver tankard, weighing 1 lb. 7 oz. 14 dwts. what will it cost me at 6s. 4d. the ounce? - - - - - Ans. 6l. 4s. $9\frac{1}{2}$ d.
39. What must be paid for 7 casks of prunes, each weighing 2 c. 1 qr. 14 lb. at 2l. 19s. 8d. per cwt. - - - - - Ans. 49l. 11s. $11\frac{1}{2}$ d.
40. Bought 14 pockets of hops, each weighing 1 c. 1 qr. 18 lb. at 4l. 2s. 6d. per cwt. what do they come to? - - - - - Ans. 81l. 9s. $4\frac{1}{2}$ d.
41. What must be given for 75 chaldrons, 7 bushels of coals, at the rate of 1l. 13s. 6d. per chaldron? - - - - - Ans. 125l. 19s. $0\frac{1}{2}$ d.
42. How much must be paid for 17 qrs. 1 peck of corn, at 3s. 10d. per bushel? - - - - - Ans. 26l. 2s. $3\frac{1}{2}$ d.
43. What cost 43 qrs. 5 bush. of corn, at 1l. 8s. 6d. the quarter? - - - - - Ans. 62l. 3s. $3\frac{1}{2}$ d.
44. How much a year will 173 acres, 2 ro. 14 pls. of land give, at the rate of 1l. 7s. 8d. per acre? - - - - - Ans. 240l. 2s. $7\frac{1}{2}$ d.
45. What will 139 pigs of lead, weighing in all 243 cwt. 2 qrs. come to, at 9l. 18s. per fother of 21 cwt. - - - - - Ans. 114l. 15s. 10d. $1\frac{2}{4}$ q.
46. What must be paid for 73 pieces of lead, each weighing 1 c. 3 qr. 7 lb. at 10l. 4s. per fother of $19\frac{1}{2}$ cwt. - - - - - Ans. 69l. 4s. 2d. $1\frac{1}{8}$ q.
47. If 5 yards of cloth cost 14s. 2d. what must be given for 9 pieces, containing each 21 yds. 1 qr. - - - - - Ans. 27l. 1s. $10\frac{1}{2}$ d.
48. If a gentleman's estate be worth 2107l. 12s. a year, what may he spend a day to save 500l. in the year? - - - - - Ans. 4l. 8s. $1\frac{1}{3}$ q.

RULE-OF-FIVE.

THIS rule is so called, because that in it there are five numbers or terms given, to find a sixth.—It is often named the *double rule-of-three*, because its questions are sometimes performed by two operations of the rule-of-three.

Note. Of the five given numbers, three contain a supposition, and the other two a demand; one of the terms of supposition being of the same kind with the number required, and the other two of the same kind as the demanding terms.

RULE for STATING.

1. Write down the term of supposition which is of the same kind with the answer, for the middle term.

2. Take one of the other two terms of supposition, and of the demanding terms, both of a kind; and from the directions given in the *rule-of-three*, consider which places they would possess if a stating were made of them and the middle term only, and place them accordingly; do the same with the other term of supposition and its correspondent demanding one, writing the terms under each other which fall on the right and left of the middle term.

METHOD of OPERATION.

1. *By two operations.*—Take the two upper terms and the middle term, in the same order as they stand, for the first stating of the rule-of-three; then take the fourth number resulting from the first stating, for the middle term; and the two under terms in the general stating, in the same order as they stand, for the extreme terms of the second stating; and the fourth term resulting from it will be the answer.

2. *By one operation.*—Multiply together the terms of which the one is above the other, on both sides of the middle term; then account the two products and the middle term, as they stand, the three terms of a rule-of-three stating, and the fourth term thence resulting will be the answer.

Note. It is generally best to work by the latter method, viz. by one operation. And after the stating, and before commencing the operation, if one of the two first terms, and either the middle term or one of the two last terms will exactly divide by one and the same number, let them be divided, and the quotients used instead of them; which will much shorten the work. Thus, if the question were to find how many men can compleat a trench of 135 yards long in 8 days, it being known that 16 men can dig 54 yards in 6 days. Having stated

stated the terms according to the rule, the 54 yards will stand above the 8 days in the first place, the 16 men in the middle, and the 135 above 6 in the last place. Then divide the 54 and 135 each by 27, and place their quotients 2 and 5 after them; also divide the 8 and 6, each by 2, and place their quotients 4 and 3 after them. Multiply then the quotients of the first two terms together, and their product is 8; and multiply the quotients of the last two together, and their product is 15; so shall 8, 16, and 15 be the 3 terms of a single flatting. Of these divide the 2d term 16 by the 1st or 8, and the quotient is 2, by which multiply 15 the 3d term, and the product is 30, the number of men required. The whole operation is here subjoined.

$$\begin{array}{l} \text{yards } 54, \text{ or } 27 \\ \text{days } 8, \text{ or } 4 \end{array} : 16 : \begin{array}{l} \text{men } 135, \text{ or } 5 \\ 6 \text{ days, or } 3 \end{array} : 30 \text{ men.}$$

$$\begin{array}{r} 8 \overline{) 16} 2 \end{array}$$

$$\begin{array}{r} 15 \\ 2 \overline{) 30} \end{array}$$

Ans. 30 men.

EXAMPLES.

1. If 100l. in one year gain 5l. interest, what will be the interest of 750l. for 7 years? - - - - - Ans. 262l. 10s.
2. If 27s. be the wages of 4 men for 7 days, what will be the wages of 14 men for 10 days? - - - - - Ans. 6l. 15s.
3. What principal will gain 262l. 10s. in 7 years, at 5l. per cent. per annum? - - - - - Ans. 750l.
4. If a footman travel 130 miles in 3 days when the days are 12 hours long, in how many days of 10 hours each, may he travel 360 miles? - - - - - Ans. $9\frac{6}{8}\frac{1}{3}$ days.
5. A wall which was to be built to the height of 27 feet, was raised to the height of 9 feet by 12 men in 6 days; how many men must be employed to finish the wall in 4 days, at the same rate of working? - - - - - Ans. 36 men.
6. If the price of 10 ounces of bread, when the corn is at 4s. 3d. per bushel, be $3\frac{1}{2}$ d. what must be paid for 2 lb. 3 oz. when the corn is 5s. per bushel? - - - - - Ans. $11\frac{2}{17}$ d.
7. What is the interest of 340l. for $2\frac{1}{2}$ years, at $4\frac{1}{2}$ l. per cent. per ann. - - - - - Ans. 38l. 5s.
8. If 120 bushels of corn can serve 14 horses 56 days, how many days will 94 bushels serve 6 horses? - - - - - Ans. $102\frac{1}{3}\frac{6}{5}$ days.
9. If 7 oz. 5 dwts. of bread be bought at $4\frac{3}{4}$ d. when corn is at 4s. 2d. per bushel, what weight of it may be bought for 1s. 2d. when the price of the bushel is 5s 6d. - - - - - Ans. 1 lb. 4 oz. $3\frac{4}{6}\frac{2}{7}$ dwts.

10. If

PRACTICE.

43

10. If the carriage of 13 cwt. 1 qr. for 72 miles be 2l. 10s. 6d. what will be the carriage of 7 cwt. 3 qrs. for 112 miles? — — — — — Ans. 2l. 5s. 11d. $1\frac{7}{8}$ q.

11. What is the interest of 300l. for 5 weeks, at 5l. per cent. per ann. — — — — — Ans. 4l. 8s. $10\frac{1}{2}$ d.

12. If 3000 lb. of beef serve 340 seamen 15 days, how many lb. will serve 120 seamen 25 days? — — — — —

Ans. 1764 lb. $11\frac{1}{2}$ oz.

RULES of PRACTICE.

BY rules of practice are meant certain expeditious methods of casting up accounts: and they consist of the most general contractions of the rule-of-three when either the first or third term is 1.

Note 1. One number is said to be an aliquot part of another, when the former divides the latter without a remainder.

2. When the quantity concerned is not very large, and of one denomination, it is commonly best to work by the first or second of the following rules; but if very large, or of several denominations, use some other of the rules of practice.

RULE I.

To find the price of any integer number of things, when that number is not very great. Multiply the price of 1 or the integer by the given number whose price is to be found, as in compound multiplication, and the product will be their price required.

EXAMPLES.

Questions.	l	s	d		Answers.	l	s	d
3 lb. of green tea, at	0	9	6	—	1	8	6	
4 lb. of bohea tea, at	0	7	8	—	1	10	8	
5 lb. of sugar, at	0	1	3	—	0	6	3	
6 lb. of flax, at	0	0	$9\frac{1}{2}$	—	0	4	9	
7 lb. of tobacco, at	0	1	$8\frac{1}{2}$	—	0	11	$11\frac{1}{2}$	
8 stones of beef, at	0	2	$7\frac{1}{2}$	—	1	1	0	
9 lb. of galls, at	0	1	5	—	0	12	9	
10 cwt. of cheese, at	2	17	10	—	28	18	4	
11 cwt. of cheese, at	1	15	6	—	19	10	6	
12 cwt. of sugar, at	3	7	4	—	40	8	0	

IF

If the multiplier exceed 12, it is commonly best to multiply successively by its component parts, as in simple multiplication.

EXAMPLES.

<i>Questions.</i>		l	s	d		<i>Answers.</i>	l	s	d
14 moidores, at	—	1	7	0	—	18	18	0	
15 pistoles, at	—	0	17	6	—	13	2	6	
16 cwt. of cheese, at		1	18	8	—	30	18	8	
18 cwt. of tobacco, at		5	11	4	—	100	4	0	
20 cwt. of hops, at		4	7	2	—	87	3	4	
21 cwt. of hemp, at		1	12	0	—	33	12	0	
22 tons of hay, at		1	2	0	—	24	4	0	
25 yds. of broad cloth, at		0	9	2	—	11	9	2	
28 yds. superf. broadcloth, at		0	19	4	—	27	1	4	
32 yds. German serge, at		0	3	7	—	5	14	8	
35 yds. Irish cloth, at		0	2	5 $\frac{1}{2}$	—	4	6	0 $\frac{1}{2}$	
40 ells of Holland, at		0	5	6	—	11	0	0	
44 ells of dowlas, at		0	1	4	—	2	18	8	
48 ac. of arable ground, at		2	3	0	—	103	4	0	
50 ac. pasture ground, at		1	4	6	—	61	5	0	
55 tuns of wine, at	83	10	0		—	4592	10	0	
60 gallons of wine, at		0	5	8	—	17	0	0	
64 gallons of brandy, at		0	9	6	—	30	8	0	
70 barrels of ale, at		1	4	0	—	84	0	0	
77 firkins of beer, at		0	11	7	—	44	11	11	
81 firkins of soap, at		1	8	9	—	116	8	9	
88 qrs. of oats, at	—	0	11	6	—	50	12	0	
96 qrs. of rye, at	—	1	3	4	—	112	0	0	
100 stones of wool, at		0	7	3	—	36	5	0	
120 doz. candles, at		0	5	9	—	34	10	0	
132 days wages, at	—	0	2	4	—	15	8	0	
24 tons of hay, at	—	3	7	6	—	81	0	0	
27 yds. of fine broad cloth, at	0	15	7		—	21	0	9	
30 yds. of shalloon, at		0	2	2 $\frac{1}{2}$	—	3	6	3	
33 yds. of flannel, at		0	1	3	—	2	1	3	
36 yds. of Scotch cloth, at		0	2	9	—	4	19	0	
42 ells of Holland, at		0	6	9 $\frac{1}{2}$	—	14	5	3	
45 ells of dowlas, at		0	1	6	—	3	7	6	
49 acr. meadow, at		1	7	10	—	68	3	10	

54 acr.

PRACTICE.

45

Questions.

	l	s	d	
54 acr. land, at	1	13	0	—
56 pipes of wine, at	37	7	6	—
63 gall. of oil, at	0	2	3	—
66 gal. of rum, at	0	8	10	—
72 hds. at —	1	14	4	—
80 firkins of butter, at	1	5	6	—
84 qrs. of wheat, at	1	12	8	—
90 qrs. of barley, at	0	17	10	—
99 bushels of malt, at	0	6	3½	—
110 sheep, at —	0	12	8	—
121 weeks wages, at	0	7	6	—
144 reams of paper, at	0	13	4	—

Answers.

l	s	d
89	2	0
2093	0	0
7	1	9
29	3	0
123	12	0
102	0	0
137	4	0
80	5	0
31	2	10½
69	13	4
45	7	6
96	0	0

Note. The following examples require the continual product of three numbers.

Questions.

	s	d	
112 lb. or 1 cwt. at	3	4½ per lb.	—
224 lb. or 2 cwt. at	7	3¼ per lb.	—
336 at	1	5 each	—
1 cwt. at	1	9 per lb.	—
336 lb or 3 cwt. at	5	2¾ per lb.	—
350 at	3	2¼ each	—

Answers.

l	s	d
18	18	0
81	8	8
23	16	0
9	16	0
87	17	0
55	15	7½

But if the multiplier cannot exactly be produced by the multiplication of small numbers, find the nearest to it, either greater or less, which can be so produced; then after having multiplied continually by the component parts of this number, to or from the last product, add or subtract the produce of so many as it is less or greater than the given number.

EXAMPLES.

Questions.

	l	s	d	
17 at	0	5	6	—
23 at	0	1	6½	—
29 at	2	5	3¼	—
34 at	0	19	7	—
38 at	1	11	5½	—
41 at	0	3	1	—
46 at	0	4	7¼	—
51 at	0	6	7¾	—

Answers.

l	s	d
4	13	6
1	15	5½
65	12	10¾
33	5	10
59	15	5
6	6	5
10	11	9½
16	18	11¾

68 at

PRACTICE.

Questions.					Answers.				
		l	s	d		l	s	d	
68	at	0	9	$11\frac{1}{4}$	_____	33	15	9	
79	at	0	11	$5\frac{3}{4}$	_____	45	6	$10\frac{1}{4}$	
94	at	0	12	2	_____	57	3	8	
106	at	0	14	$7\frac{1}{4}$	_____	77	8	$0\frac{1}{2}$	
59	at	0	7	10	_____	32	2	2	
117	at	1	2	3	_____	130	3	3	
19	at	0	13	2	_____	12	10	2	
26	at	0	3	$0\frac{3}{4}$	_____	3	19	$7\frac{1}{2}$	
31	at	0	17	$5\frac{1}{2}$	_____	27	1	$2\frac{1}{2}$	
37	at	0	12	$10\frac{1}{4}$	_____	23	15	$7\frac{1}{4}$	
39	at	0	7	$3\frac{3}{4}$	_____	14	5	$2\frac{1}{4}$	
43	at	0	2	10	_____	6	1	10	
47	at	0	5	$2\frac{1}{2}$	_____	12	4	$9\frac{1}{2}$	
53	at	3	15	2	_____	199	3	10	
62	at	0	8	5	_____	26	1	10	
74	at	0	10	$0\frac{1}{2}$	_____	37	3	1	
86	at	0	0	7	_____	2	10	2	
104	at	0	13	$5\frac{1}{2}$	_____	69	19	8	
114	at	0	15	$3\frac{1}{4}$	_____	87	5	$7\frac{1}{2}$	
127	at	3	0	2	_____	382	1	2	

R U L E II.

When there is given the price of some certain number, to find the price of the integer, or 1. Divide the given price by its number, as in compound division, and the quotient will be the price of 1 as required.

E X A M P L E S.

Questions.					Answers.				
		l	s	d		l	s	d	
If	3lb. cost	2	14	6,	what is 1?	—	0	18 2	
If	4 cost	7	8	2,	what is 1?	—			
If	5 cost	2	17	10,	what is 1?	—			
If	6 cost	17	3	0,	what is 1?	—			
If	7 cost	2	13	4½,	what is 1?	—			
If	8 cost	57	1	2,	what is 1?	—			
If	9 cost	19	3	6¼,	what is 1?	—			
If	10 cost	121	5	8,	what is 1?	—			
If	11 cost	6	14	2¾,	what is 1?	—			
If	12 cost	27	18	7,	what is 1?	—			

When

When the number or divisor exceeds 12, it is best to divide successively by its component parts, as in simple division.

*Questions.**Answers.*

		l	s	d
If 16 cwt. cost 30l. 18s. 8d. what is 1?	—	1	18	8
If 22 cwt. cost 24l. 4s. what is 1?	—	1	2	0
Divide 5l. 14s. 8d. by 32.	—	0	3	7
Divide 2l. 18s. 8d. into 44 equal parts.	—	0	1	4
Divide 4592l. 10s. equally among 55 persons.	83	10	0	
If 70 be 84l. what is 1?	—	1	4	0
If 88 cost 50l. 12s. what will 1 be?	—	0	11	6
Divide 34l. 10s. by 120.	—	0	5	9
If 18 cwt. cost 100l. 4s. what is 1?	—	5	11	4
If 27 cwt. cost 21l. 9d. what is 1?	—	0	15	7
Divide 4l. 19s. by 36.	—	0	2	9
Divide 68l. 3s. 10d. into 49 equal parts.	—	1	7	10
Divide 7l. 1s. 9d. equally among 63 persons.	—	0	2	3
If 80 be 102l. what is 1?	—	1	5	6
If 99 cost 31l. 2s. 10½d. what will 1 be?	—	0	6	3½
Divide 45l. 7s. 6d. by 121.	—	0	7	6

Note, The following examples require three divisions.

At 18l. 18s. per cwt. how much per lb?	—	0	3	4½
Divide 81l. 8s. 8d. by 224.	—	0	7	3¼
At 9l. 16s. per cwt. how much per lb?	—	0	1	9
Divide 55l. 15s. 7½d. by 350.	—	0	3	2¼

But if the divisor cannot be produced by the multiplication of small numbers, you must divide by it after the manner of long division.

EXAMPLES.

	l	s	d		l	s	d		l	s	d		l	s	d
17)	4	13	6	(0	5	6		19)	12	10	2	(0	13	2	
29)	65	12	10½	(2	5	3½		37)	23	15	7½	(0	12	10½	
41)	6	6	5	(0	3	1		53)	199	3	10	(3	15	2	
86)	2	10	2	(0	0	7		127)	382	1	2	(3	0	2	

RULE

RULE III.

If the given price of 1 or the integer be an aliquot part of a penny, shilling, or pound, take the same part of the given quantity whose price is to be found (by dividing it by the number of times which the given price of 1 is contained in a penny, shilling, or pound) for the answer in pence, shillings, or pounds respectively.

A Table of the Aliquot Parts of Money.

s	d	l	s	d	l	d	l	s
10	0	is $\frac{1}{2}$	1	3	is $\frac{1}{16}$	3	is $\frac{1}{80}$ or $\frac{1}{4}$	
6	8	is $\frac{1}{3}$	1	0	is $\frac{1}{20}$	2½	is $\frac{1}{8}$	
5	0	is $\frac{1}{4}$	10	is $\frac{1}{24}$		2	is $\frac{1}{20}$ or $\frac{1}{5}$	
4	0	is $\frac{1}{5}$	8	is $\frac{1}{30}$		1½	is $\frac{1}{100}$ or $\frac{1}{8}$	
3	4	is $\frac{1}{6}$	7½	is $\frac{1}{32}$	s	1¼	is $\frac{1}{160}$	
2	6	is $\frac{1}{8}$	6	is $\frac{1}{40}$ or $\frac{1}{2}$		1	is $\frac{1}{240}$ or $\frac{1}{12}$	
2	0	is $\frac{1}{10}$	5	is $\frac{1}{48}$		¾	is $\frac{1}{120}$ or $\frac{1}{16}$	
1	8	is $\frac{1}{12}$	4	is $\frac{1}{60}$ or $\frac{1}{3}$		½	is $\frac{1}{480}$ or $\frac{1}{24}$	
1	4	is $\frac{1}{15}$	3½	is $\frac{1}{64}$		¼	is $\frac{1}{960}$ or $\frac{1}{48}$	

EXAMPLES.

Questions.				Answers.			
	s	d		l	s	d	
2103 at 10	0		_____	1051	10	0	
715 at 6	8		_____	238	6	8	
1496 at 5	0		_____	374	0	0	
420 at 4	0		_____	84	0	0	
831 at 3	4		_____	138	10	0	
275 at 2	6		_____	34	7	6	
937 at 2	0		_____	93	14	0	
3890 at 1	8		_____	324	3	4	
624 at 1	4		_____	41	12	0	
159 at 1	3		_____	9	18	9	
472 at 1	0		_____	23	12	10	
521 at 0	10		_____	21	14	12	
376 at 0	8		_____	12	10	8	
916 at 0	7½		_____	28	12	16	
1270 at 0	6		_____	31	15	0	
835 at 0	5		_____	17	7	11	

609	at	o	4	_____
581	at	o	$\frac{3}{4}$	_____
716	at	o	3	_____
193	at	o	$2\frac{1}{2}$	_____
807	at	o	2	_____
2305	at	o	$1\frac{1}{2}$	_____
3019	at	o	$1\frac{1}{4}$	_____
4718	at	o	1	_____
1927	at	o	$6\frac{3}{4}$	_____
741	at	o	$6\frac{1}{2}$	_____
5804	at	o	$6\frac{1}{4}$	_____

10	3	0
9	1	$6\frac{3}{4}$
8	19	0
20	6	$10\frac{1}{2}$
6	14	6
14	8	$1\frac{1}{2}$
15	14	$5\frac{3}{4}$
19	13	2
6	0	$5\frac{1}{4}$
1	10	$10\frac{1}{2}$
6	0	11

R U L E IV.

If the given price be no aliquot part of a penny, shilling, or pound: divide it into several aliquot parts, then work for each by rule 3, and the sum will be the answer.

Or, It may often be divided so, that the less will be aliquot parts of the greater; then take the same parts of the prices found for the greater.

E X A M P L E S.

Questions.

	s	d	
2173	at	o	$1\frac{3}{4}$ _____
796	at	o	$2\frac{1}{4}$ _____
193	at	o	$2\frac{3}{4}$ _____
3406	at	o	$3\frac{1}{4}$ _____
596	at	o	$3\frac{1}{2}$ _____
802	at	o	$4\frac{1}{4}$ _____
1234	at	o	$4\frac{1}{2}$ _____
370	at	o	$4\frac{3}{4}$ _____
951	at	o	$5\frac{1}{4}$ _____
603	at	o	$5\frac{1}{2}$ _____
239	at	o	$5\frac{3}{4}$ _____
1980	at	o	$6\frac{1}{4}$ _____
271	at	o	$6\frac{1}{2}$ _____
714	at	o	$6\frac{3}{4}$ _____
591	at	o	7 _____
275	at	o	$7\frac{1}{4}$ _____
596	at	o	$7\frac{3}{4}$ _____
1490	at	o	8 _____

Answers.

l	s	d
15	16	$10\frac{3}{4}$
7	9	3
22	7	$6\frac{3}{4}$
46	2	$5\frac{1}{2}$
8	3	1
14	4	$6\frac{1}{2}$
23	2	9
7	6	$5\frac{1}{2}$
20	16	$6\frac{3}{4}$
13	10	$4\frac{1}{2}$
5	14	$6\frac{1}{4}$
51	11	3
7	6	$5\frac{1}{2}$
20	1	$5\frac{1}{2}$
17	4	9
8	6	$1\frac{3}{4}$
19	4	1
51	4	$4\frac{1}{2}$

Questions.

		s	d	
621	at	0	$8\frac{1}{2}$	_____
4681	at	0	$8\frac{1}{4}$	_____
753	at	0	9	_____
421	at	0	$9\frac{1}{4}$	_____
210	at	0	$9\frac{1}{2}$	_____
765	at	0	$9\frac{3}{4}$	_____
461	at	0	$10\frac{1}{4}$	_____
273	at	0	$10\frac{1}{2}$	_____
536	at	0	$10\frac{3}{4}$	_____
910	at	0	11	_____
5391	at	0	$11\frac{1}{4}$	_____
372	at	0	$11\frac{1}{2}$	_____
420	at	0	$11\frac{3}{4}$	_____
2163	at	1	7	_____
364	at	2	5	_____
531	at	3	9	_____
467	at	4	3	_____
205	at	5	11	_____
1734	at	6	$10\frac{1}{2}$	_____
769	at	7	9	_____
134	at	8	$3\frac{3}{4}$	_____
410	at	9	$7\frac{3}{4}$	_____
416	at	10	$5\frac{1}{2}$	_____
305	at	11	$9\frac{1}{4}$	_____
1209	at	12	7	_____
714	at	13	6	_____
197	at	14	$3\frac{1}{2}$	_____
251	at	15	7	_____
612	at	16	$4\frac{3}{4}$	_____
247	at	17	9	_____
816	at	18	$2\frac{1}{4}$	_____
970	at	19	8	_____

Answers.

l	s	d
21	19	$10\frac{1}{2}$
170	13	$2\frac{3}{4}$
28	4	9
16	4	$6\frac{1}{4}$
8	0	3
31	1	$6\frac{3}{4}$
19	13	$9\frac{1}{4}$
11	18	$10\frac{1}{2}$
24	0	2
41	14	2
252	4	$0\frac{3}{4}$
17	16	6
20	11	3
171	4	9
43	19	8
99	11	3
99	4	9
60	12	11
596	1	3
297	19	9
55	8	$3\frac{1}{2}$
197	14	$9\frac{1}{2}$
217	10	8
179	10	$1\frac{1}{4}$
760	13	3
481	19	0
140	15	$5\frac{1}{2}$
195	11	5
501	14	3
219	4	3
742	1	0
953	16	8

RULE V.

If there be pounds in the price, multiply the given quantity by the number of them: and if there be also some odd money, find its produce by the former rules, and add them together.

Questions.

PRACTICE.

51

EXAMPLES.

Questions.				Answers.			
	l	s	d		l	s	d
213 at	5	0	0	_____	1065	0	0
708 at	17	0	0	_____	12036	0	0
1150 at	2	7	6	_____	2731	5	0
623 at	3	9	0	_____	2149	7	0
407 at	1	13	5	_____	680	0	7
4613 at	1	5	7	_____	5900	15	11
941 at	7	0	4	_____	6602	13	8
318 at	4	6	10	_____	1380	13	0
532 at	2	15	6	_____	1476	6	0

RULE VI.

When there is some odd weight or measure in the quantity; after having multiplied the price by the number of integers (if there be any) divide the odd quantity into aliquot parts of the integer, or of each other; and take the same parts of the price of the integer, or of the price of each other, and add them all together.

A TABLE of the aliquot parts of cwt.

lb	cwt	lb	cwt	
56 is	$\frac{1}{2}$	4 is	$\frac{1}{25}$	
28 is	$\frac{1}{4}$	$3\frac{1}{2}$ is	$\frac{1}{33}$	
16 is	$\frac{1}{7}$	2 is	$\frac{1}{50}$	Note. Aliquot parts
14 is	$\frac{1}{8}$	$1\frac{3}{4}$ is	$\frac{1}{64}$	or most other things
8 is	$\frac{1}{14}$	1 is	$\frac{1}{112}$	are easily found.
7 is	$\frac{1}{16}$			

EXAMPLES.

Questions.				Answers.			
	l	s	d		l	s	d
17 cwt. 3 qr. _____ at	1	7	0	per cwt.	23	19	3
1 cwt. 1 qr. 8 lb. at	1	17	0	_____	2	8	$10\frac{1}{2}$
2 cwt. 2 qr. _____ at	3	14	3	_____	9	5	$7\frac{1}{2}$
2 qr. 2 lb. _____ at	0	19	$7\frac{1}{2}$	_____	0	10	$1\frac{1}{4}$
3 cwt. $22\frac{3}{4}$ lb. _____ at	0	13	$5\frac{3}{4}$	_____	2	3	2
2 qr. $18\frac{1}{4}$ lb. _____ at	0	15	$2\frac{1}{4}$	_____	0	10	$6\frac{1}{2}$
3 qr. $12\frac{1}{2}$ lb. _____ at	2	16	10	_____	2	8	$11\frac{1}{2}$
7 cwt. 2 qr. $15\frac{1}{2}$ lb. at	3	0	7	_____	23	2	9
	C	2					
						3	ton,
						5	

PRACTICE.

Questions.				Answers.					
		l	s	d		l	s	d	
3 ton, 5 c. 2 qr.	—	at	7	9	3	per ton	24	8	$9\frac{1}{2}$
17 lb. 5 oz. 14 dwts.		at	3	6	9	per lb.	58	6	$5\frac{3}{4}$
15 lb. 2 oz. 5 dwt.		at	4	7	0	<hr/>	65	1	$3\frac{3}{4}$
7 oz. 15 dwt. 12 gr.		at	0	6	3	per oz.	2	8	7
5 oz. 6 dwt. 17 gr.		at	0	5	10	<hr/>	1	11	$1\frac{1}{4}$
3 yds. 1 qr.	—	at	0	17	6	per yd.	2	16	$10\frac{1}{2}$
4 yds. 2 qr. 3 nls.		at	1	2	4	<hr/>	5	4	$8\frac{3}{4}$
1 qr. 2 nls.	—	at	1	12	6	<hr/>	0	12	$2\frac{1}{4}$
32 ac. 1 ro. 14 pls.		at	1	16	0	per acr.	58	4	$1\frac{1}{2}$
14 ac. 3 ro. 5 pls.	—	at	2	12	10	<hr/>	39	0	$11\frac{1}{4}$
3 gal. 5 pts.	—	at	0	7	6	per gal.	1	7	$2\frac{1}{4}$
12 gal. 3 pts.	—	at	0	5	8	<hr/>	3	10	$1\frac{1}{2}$

RULE VII.

If the price be any even number of shillings; multiply the quantity by half their number, doubling the first figure of the product for shillings; the rest are pounds.

EXAMPLES.

Questions.				Answers.			
		s			l	s	
173	at	2	— — —		17	6	
259	at	4	— — —		51	16	
703	at	6	— — —		210	18	
5013	at	8	— — —		2005	4	
872	at	10	— — —		436	0	
460	at	12	— — —		276	0	
627	at	14	— — —		438	18	
598	at	16	— — —		478	8	
214	at	18	— — —		192	12	

RULE VIII.

When the price is any odd number of shillings; work for the greatest even number contained in it by the last rule, and for the other shilling take $\frac{1}{20}$ th of the given quantity as in rule 1. Or, multiply by the number of shillings, and divide the product by 20 to reduce it to pounds.

EXAMPLES.

PRACTICE:

537

EXAMPLES.

Questions.		Answers.	
	s	l	s
732 at 3	_____	109	16
147 at 7	_____	51	9
371 at 9	_____	166	19
586 at 11	_____	322	6
240 at 13	_____	156	0
652 at 15	_____	489	0
897 at 17	_____	762	9
1046 at 19	_____	993	14

RULE IX.

If there be a fraction in the given quantity; after having worked for the integral part by any of the former rules, find the produce of the fraction by multiplying the price by the numerator, and dividing the product by the denominator, then add them together for the answer.

EXAMPLES.

Questions.				Answers.			
	l	s	d		l	s	d
273 $\frac{1}{4}$ at 0 2 6	_____			34	3		$1\frac{1}{2}$
75 $1\frac{1}{2}$ at 2 17 10	_____			2173	1		9
53 $0\frac{3}{4}$ at 0 14 0	_____			371	10		6
178 $\frac{3}{8}$ at 0 17 0	_____			151	12		$4\frac{1}{2}$
231 $\frac{5}{8}$ at 0 7 $9\frac{1}{2}$	_____			90	4		$8\frac{1}{4}$
762 $\frac{3}{5}$ at 1 12 6	_____			1239	4		6
817 $\frac{3}{10}$ at 3 7 4	_____			2751	11		$6\frac{1}{4}$

BILLS OF PARCELS, BOOK-DEBTS, &c.

M R. James Elford, Bought of William Woollendrapers.

Newcastle, 2d of March, 1777.		s	d
15 yds. of Fine Broad Cloth,	at	13	6 per yd.
24 - - Superfine ditto	- -	18	9 - -
27 - - Yard-wide ditto	- -	8	4 - -
16 - - Drugget	- -	6	3 - -
12 - - Serge	- -	2	10 - -
32 - - Shalloon	- -	1	8 - -

£.53 4 10

Mr. Nicholas Norton, Bought of Henry Hofier.

London, 24th of March, 1777.		s	d
9 pair of Worsted Stockings	at	4	6 per pair.
6 - - Silk ditto	- -	15	9 - -
17 - - Thread	- -	5	4 - -
23 - - Cotton	- -	4	10 - -
14 - - Yarn	- -	2	4 - -
18 - - Women's Silk Gloves	- -	4	2 - -
19 yds. of Flannel	- -	1	7½ per yd.

£.23 15 4½

Mr. Mathew Milton,

Bought of Leonard Linendraper, and Co.

Durham, 9th of April, 1777.		s	d
40 ells of Dowlas	at	1	6 per ell.
34 - - Diaper	- -	1	4½ - -
31 - - Holland	- -	5	8 - -
29 yds. of Irish Cloth	- -	2	4 per yd.
17½ - - Muslin	- -	7	2½ - -
13½ - - Cambric	- -	10	6 - -
27 - - Printed Linen	- -	2	5 - -

£.34 5 10½

The

The honourable Lady Strawberry,

To Miles Mercer, Dr.

York, 1777		s	d
April 12th,	9½ yds. of Silk at	12	9 per yd.
27th,	13 - - Flowered do.	15	6 - -
June 18th,	11½ - - Lustring —	6	10 - -
— 14 - -	Brocade —	11	3 - -
July 22d,	12½ - - Sattin —	10	8 - -
30th,	11½ - - Velvet —	18	0 - -

£.44 15 10

Samuel Simpson, Esq.

To George Grocer, Dr.

London, 1777.		s	d
July 18th,	15½ lb. Currants - at	0	4 per lb.
— 17½	Malaga Raisins -	0	5½ - -
— 19½	Raisins of the Sun	0	6 - -
Aug. 10th,	17 - - Rice - - -	0	3½ - -
13th,	8½ - - Pepper - - -	1	6 - -
Sept. 14th,	3 Sugar, wt. 32½ lb -	0	8½ - -
21st,	13 oz. of Cloves - -	0	9 per oz.

£. 3 13 0½

Ben. Bibant, Esq.

Bought of William Winecooper.

6th of May, 1777.		s	d
Palm Sack - -	12 gallons, at	8	6 per gal.
Port, Red - -	17 - - -	5	8 - -
Claret - -	9 - - -	8	9 - -
Lisbon White -	34 - - -	4	10 - -
Rhenish - -	22½ - - -	6	4 - -
Sherry - -	27½ - - -	6	2 - -

£.37. 15 0½

Mrs. March,

To Mary Milliner, Dr.

17 7, Bristol.		s	d	
May 3d. Silver Ribbon, 21 yds. at 2	2	2	per yd.	
7 h, Fine Lace, 11½	-	10	6	
— Scarenet Hood, 8	-	4	3	
June 10th, India Fans, - 17	-	3	10	
12th, Kid Gloves, - 9 pair	-	2	2 p. pair	
July 6th, Lamb ditto, - 5 doz.	-	1	2	
7th, Bobbin, - 12 pcs.	-	0	5 p. pce.	

 £.18 0 11

Mr. Roger Retail,

Bought of Thomas Teapot and Co.

June 3d, 1777.		s	d	
24½ lb. of Royal Green Tea, at 18	6	per lb.		
21½ - - Imperial Tea, - - -	24	0		
35¾ - - Best Bohea, - - -	13	10		
1½ - - Coffee - - -	5	4		
25 - - Double-refined Sugar, 1	13			
9 Sugar Loaves, wt. 137lb.	-	0	7½	

 £.83 5 9

Capt. James Dixon, Bought of Christopher Cornchandler.

25th of July, 1777,	1	8	d	
Wheat, 7 qrs. 3 bush. at 1	8	0	per qr.	
Rye, 9 - 7 - - -	1	1	6	
Oats, 17 - 4 - - -	0	10	8	
Peas, 12 bush. - - -	0	2	9 per bush.	
Beans, 9 - - - -	0	3	5	
Malt, 17 - - - -	0	4	8	
Hops, 25 lb. - - -	0	7	4 per lb.	

 £.39 1 10½

Mr.

Mr. Conrade Compound, Bought of Daniel Druggift.
London, 17th of Aug. 1777.

		s	d	
Cochineal,	- 21 $\frac{3}{8}$ lb. at	29	6	per lb.
Opium,	- - 6 $\frac{1}{4}$ - -	6	4	- -
Scammony,	- 53 $\frac{1}{8}$ - -	8	10	- -
Contrayerva,	- 14 $\frac{3}{4}$ - -	17	0	- -
Galls,	- - 93 - -	0	10	- -
Gum Arabic,	- 71 $\frac{1}{8}$ - -	1	2 $\frac{1}{2}$	- -
Sassafras,	- 122 - -	0	4 $\frac{3}{4}$	- -

£. 80 1 0 $\frac{1}{2}$

Sir Jeffery Slingstone, Bought of Samuel Silversmith.
Sept. 8th, 1777. oz dwt gr s d

A punch-bowl, wt.	23	4	0	at	5	10	per oz.
A Tankard, - -	10	3	6	-	6	2	- -
A Tea-pot and Lamp,	30	5	12	-	7	3	- -
6 Plates, - - -	73	11	5	-	6	1	- -
18 Spoons - - -	41	0	10	-	6	3	- -

£. 56 1 4

Mr. George Davis, Bought of Champien Cheesemonger.

		cwt	qr	lb	l	s	d
13 Cheshire Cheeses, wt.	5	3	12	at	1	12	6 per cwt.
15 Gloucester ditto	- 3	0	18	-	1	8	0 - -
47 Stilton ditto, - -	- 1	2	5	-	2	4	8 - -
17 lb. of cream ditto,	- - -	-	-	-	0	0	7 $\frac{1}{2}$ per lb.
9 Fitches of Bacon, wt.	53	ft.	3	lb.	0	4	8 - ft.
15 $\frac{1}{2}$ Firkins of Butter	- - -	-	-	-	1	8	0 each

£. 52 0 9 $\frac{1}{2}$

TARE and TRET.

GROSS weight of any commodity, is its own weight together with that of its package, whether cask, chest, or whatever else.

Tare is the weight of the package, or an allowance made instead of it.—What remains after the tare is taken from the gross, may be called tare futtle, if there be more deductions.

Tret is an allowance of 4 lb. upon every 104 lb. of tare-futtle, on account of dust or other waste.—What remains after tret is deducted, may be called tret-futtle, if there be any following deduction.

Cloff is an allowance of 2 lb. for every 3 cwt. and some say for every 100 lb. of tret-futtle, to make the weight hold good when sold by retail.

When all the deductions are made, the last remainder is called neat or net weight.

Note, When the tare is at so much per cwt. it will be best to divide it into aliquot parts of it, like as in the rule of practice.

2. The tret being 4 to 104, or 1 to 26, will be found by taking the 26th part of the tare-futtle.

3. In calculating oil and spirits, $7\frac{1}{2}$ lb. neat are allowed to the gallon.

EXAMPLES.

1. Gross 17 cwt. 3 qr. 14 lb. tare 12 lb. per cwt. tret 4 to 104, and cloff 2 to 100 or 1 to 50. How much neat?

	lb	cwt	qr	lb	
		17	3	14	gross
8 = $\frac{1}{4}$		1	1	3	
4 = $\frac{1}{2}$		0	2	$15\frac{1}{2}$	
		1	3	$18\frac{1}{2}$	tare
	26	15	3	$23\frac{1}{2}$	tare-futtle
		0	2	$12\frac{3}{4}$	tret
	50	15	1	$10\frac{3}{4}$	tret-futtle
		0	1	$6\frac{3}{4}$	cloff
		15	0	$4\frac{1}{2}$	neat

2. What

2. What is the neat produce of 30 barrels of anchovies, weighing each 36 lb. gross, allowing 8 lb. per cent. tare?

Ans. 993 $\frac{1}{2}$ lb.

3. Gross 12 cwt. 14 lb. tare 1 cwt. 2 qr. 18 lb. how much neat?

Ans. 10 cwt. 1 qr. 24 lb.

4. Suppose 3 cwt. 1 qr. 5 lb. tare were allowed on 71 cwt. 3 qr. of tobacco, what would be the neat weight?

Ans. 68 cwt. 1 qr. 23 lb.

5. In five chests of sugar, weighing 112 cwt. 1 qr. gross, how much neat, allowing 121 lb. tare?

Ans. 111 cwt. 19 lb.

6. In 26 bags of hops, containing 73 cwt. 3 qr. gross, tare 10 lb per bag; how much neat?

Ans. 71 cwt. 1 qr. 20 lb.

7. What is the neat weight of 20 barrels of figs, each 3 cwt. 1 qr. 5 lb. gross, tare 14 lb. per barrel?

Ans. 63 cwt. 1 qr. 16 lb.

8. In 15 hhds. of tobacco, each 2 cwt. 1 qr. 12 lb. gross, tare 1 qr. 4 lb. per hhd. how much neat?

Ans. 31 cwt. 8 lb.

9. What is the neat weight of 3 barrels of indigo, each 3 cwt. 2 qr. gross, tare 10 $\frac{1}{2}$ lb. per cwt.

Ans. 9 cwt. 2 qr. 1 $\frac{1}{2}$ lb.

10. What is the neat weight of 4 hhds. of sugar, weighing as under,

	c	qr	lb	
gross	3	2	14	} tare of the whole 1 cwt. 3 qr. 5 lb.
	5	1	7	
	2	3	18	
	1	3	26	

Ans. 12 cwt. 4 lb.

11. Five casks of raisins, wt. viz.

	cwt	qr	lb	lb	
1.	3	2	12	tare	18
2.	2	3	9	-	16
3.	4	1	17	-	23
4.	5	0	8	-	27
5.	1	3	20	-	14

} how much neat?

Ans. 16 cwt. 3 qr. 24 lb.

12. What is the neat weight of the three following lots of wormseed? viz.

	cwt	qr	lb	
N ^o 1.	3	2	8	— tare 12 lb. each.
2.	2	3	26	
3.	3	1	15	Ans. 9 cwt. 2 qr. 13 lb.

13. In 15 cwt. 3 qr. 14 lb. gross, tare 13 lb. per cwt. and tret 4 lb. per 104 lb. how much neat?

Ans. 13 cwt. 1 qr. 27 $\frac{1}{2}$ lb.

14. Suppose 17 $\frac{1}{2}$ lb. per cwt. tare, and 4 lb. per 104 lb. tret were allowed on 7 casks of prunes, each 3 cwt. 1 qr. 5 lb. gross; what would be the neat weight?

Ans. 18 cwt. 2 qr. 24 lb.

15. What is the neat weight of 3 hhds. of sugar, weighing as follows: the first, 4 cwt. 5 lb. gross, tare 73 lb. the second, 3 cwt. 2 qr. gross, tare 56 lb. and the third, 2 cwt. 3 qr. 17 lb. gross, tare 47 lb. allowing also 4 lb. per 104 lb. tret.

Ans. 8 cwt. 2 qr. 4 lb.

16. In 4 casks of currants, each 7 cwt. 1 qr. 12 lb. gross, tare 2 qr. 10 lb. per cask, tret 4 lb. per 104 lb. and cloff 2 lb. per 100 lb. how much neat?

Ans. 25 cwt. 2 qr. 1 $\frac{1}{4}$ lb.

17. In 23 cwt. 3 qr. 7 lb. gross, how much neat, allowing 1 qr. 3 lb. per cwt. tare, 4 lb. per 104 lb. tret, and 2 lb. per 300 lb. cloff? —

Ans. 16 cwt. 1 qr. 22 $\frac{1}{2}$ lb.

18. In 17 cwt. 17 lb. gross weight of galls, how much neat, allowing 18 lb. per cent. tare 4 lb. per 104 lb. tret, and 2 lb. per 3 cwt. cloff?

Ans. 13 cwt. 3 qr. 1 $\frac{1}{2}$ lb.

19. In three casks of oil weighing as follows: N^o 1. 3 cwt. 17 lb. N^o 2. 2 cwt. 3 qrs. 5 lb. N^o 3. 4 cwt. 1 qr. 17 lb. how many gallons, allowing 18 lb. per cwt. tare, and 7 $\frac{1}{2}$ lb. neat to a gallon?

Ans. 129 $\frac{1}{4}$ gal.

20. In 7 casks of oil, each weighing 3 cwt. 1 qr. gross, how many neat gallons, allowing 20 lb. per cwt. tare, and 7 $\frac{1}{2}$ lb. per gallon?

Ans. 279 $\frac{1}{15}$ lb.

VULGAR FRACTIONS.

A FRACTION, or broken number, is an expression of one or more parts of any number.

The number of parts into which the number is supposed to be divided, is called the *denominator*; and the number of those parts expressed by the fraction, is called the *numerator*. Also these two numbers are in general named the *terms* of the fraction.

If the number of which the fraction is part, or parts, be 1, it is called a *simple* fraction; and is denoted by the numerator written above the denominator with a small line between them: So, $\frac{1}{4}$ denotes one-fourth of 1; $\frac{3}{5}$ denotes three-fifths of 1.

But if the number be different from 1, the fraction is called a compound one, and is denoted by the word *of*, and the number subjoined to the numerator and denominator expressed as before. So, $\frac{1}{4}$ of 6, denotes one-fourth of 6; $\frac{3}{5}$ of 8, denotes three-fifths of 8; and $\frac{2}{3}$ of $\frac{3}{4}$, denotes two-thirds of three-fourths of 1.

Simple fractions, whose numerators are less than their denominators, are called *proper* fractions.—And those whose numerators are equal to or greater than their denominators, are called *improper* fractions.

The expression formed from an integer and a fraction joined together, is called a *mixt number*.

Note 1. Simple fractions whose numerators are less than, equal to, or greater than their denominators, are respectively less than, equal to, or greater than 1.

2. A fraction, having a fraction or mixt number for its numerator or denominator, or both, is by some called a *complex fraction*.

3. A whole or integer number may be expressed like a fraction by writing 1 under it for a denominator: So 3 may be denoted by $\frac{3}{1}$, and 12 by $\frac{12}{1}$.

4. A fraction denotes division, and its value is equal to the quotient obtained by dividing the numerator by the denominator: thus $\frac{12}{4}$ is equal to 3, and $\frac{20}{5}$ equal to 4.

$$5. \left\{ \begin{array}{c} \frac{\quad}{+} \\ \frac{\quad}{-} \\ \frac{\quad}{\times} \\ \frac{\quad}{\div} \end{array} \right\} \text{denotes} \left\{ \begin{array}{c} \text{equ.} \\ \text{add.} \\ \text{sub.} \\ \text{mul.} \\ \text{div.} \end{array} \right\} \text{and is named} \left\{ \begin{array}{c} \text{is equal to} \\ \text{plus, or more} \\ \text{minus, or less} \\ \text{into} \\ \text{by} \end{array} \right\} \text{thus} \left\{ \begin{array}{l} 8 + 2 = 10 \\ 8 - 2 = 6 \\ 8 \times 2 = 16 \\ 8 \div 2 = 4 \end{array} \right.$$

Besides these, ∞ is written between two numbers, to denote their difference when it does not appear whether of them is the greater; as $\frac{1}{7} \infty \frac{9}{17}$ denotes the difference of these two fractions.

REDUCTION OF VULGAR FRACTIONS.

Note 6. If both the numerator and denominator of a fraction be multiplied or divided by the same number, the fraction will still retain its original value.

Let $\frac{3}{5}$ and $\frac{8}{12}$ be two fractions proposed: then $\frac{3}{5} \times \frac{2}{2} = \frac{6}{10}$; and $\frac{8}{12} \div \frac{4}{4} = \frac{2}{3}$. That is, if the numerator 3, and denominator 5, of the first fraction, be each multiplied by the same number 2, the produced fraction $\frac{6}{10}$, is equal to the proposed one $\frac{3}{5}$. For the numerator and denominator of the produced fraction, are in the same proportion as the numerator and denominator of the proposed one. Also, if the numerator 8 and the denominator 12, of the second fraction, be each divided by the same number 4, the fractions $\frac{2}{3}$ and $\frac{8}{12}$, are equal, for the same reason.

By this useful note, several fractions of different denominators may be readily reduced to a common denominator. Thus, $\frac{1}{3}$ may be reduced to the same denominator as $\frac{2}{5}$, by multiplying its terms by 5, by which it becomes $\frac{5}{15}$. Also $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{6}$ may be reduced to a common denominator, by multiplying the terms of the first fraction by 6, of the second by 3, and dividing those of the last by 5.

REDUCTION OF VULGAR FRACTIONS.

I. *TO abbreviate, or reduce fractions to less terms.*

R U L E I.

Divide the terms of the given fraction by any number which will divide them without a remainder, so shall the quotients be the terms of a new fraction, equal in value to the former; and this you may abbreviate again, and the next again, and so on, till it appear that there is no number greater than 1 that will divide them, in which case the fraction is said to be in its *least* terms.

E X A M P L E S.

Let $\frac{42}{72}$ be proposed to be abbreviated.

$$\frac{42}{72} = \frac{21}{36} = \frac{7}{12}, \text{ by dividing first by 2 and then by 3.}$$

Reduce $\frac{36}{72}$ to its least terms.

Reduce $\frac{124}{96}$ to its least terms.

Reduce $\frac{212}{144}$ to its least terms.

Note I.

REDUCTION OF VULGAR FRACTIONS.

61

Note 1. Any number ending with an even numb 1, or a cypher, may be divided by 2.

EXAMPLES.

$$\frac{16}{24} = \frac{8}{12} = \frac{4}{6} = \frac{2}{3}.$$

$$\frac{32}{56} =$$

$$\frac{120}{236} =$$

Note 2. Any number ending with 5 or 0 is divisible by 5.

EXAMPLES.

$$\frac{35}{40} = \frac{7}{8}.$$

$$\frac{75}{100} =$$

Note 3. Any number is divisible by 3 if the sum of its digits be 6: Thus 417 is divisible by 3, because 12, which is the sum of 4, 1, and 7, is 6.

EXAMPLES.

$$\frac{45}{120} = \frac{15}{40} = \frac{3}{8}.$$

$$\frac{126}{411} =$$

$$\frac{534}{672} =$$

Note 4. If there be any cyphers at the end of each, cut off as many as are common to both.

EXAMPLES.

$$\frac{200}{340} = \frac{20}{34} = \frac{10}{17}.$$

$$\frac{1200}{18000} =$$

Note 5. When any number which is expressed by several others with the sign of addition or subtraction between them, is to be divided by any number; then all the parts of it must be divided by this number.

$$\text{Thus } \frac{4+6-8}{2} = 2+3-4 = 5-4 = 1.$$

Note 6. But if the given number be expressed by others with the sign of multiplication between them, only one of them must be divided: So

$$\frac{7 \times 3 \times 8 \times 10}{7 \times 2 \times 6} = \frac{3 \times 4 \times 10}{1 \times 6} = \frac{1 \times 4 \times 10}{1 \times 2} = \frac{1 \times 2 \times 10}{1 \times 1} = \frac{20}{1} = 20.$$

And in this case, when the same number is in both the numerator and denominator, it may be left out of them.

N. B. But instead of writing down the whole fraction a-new after every division in the abbreviation, as is here done in this last example in five different values one after another in the whole length of the line, the shortest method, and which is constantly practised by those who best know the value and use of this part of the abbreviation, is thus; whatever numbers are abbreviated, or which cancel one another, draw a small line through them with the pen, and place the quotients of the numbers above them or below them, according as they are in the numerator or denominator. So the foregoing fraction being here again written down, dash or draw a small line through the two sevens because they cancel each other, as being equal; then dash the 3 and the 6, and write the quotient 2 below the 6; next dash the 8 and a 2, writing the quotient 4 above the 8; lastly dash the 4 and the other 2, writing their quotient 1 above the 4; there being then no more figures to divide by, multiply together the numbers 1 and 10, which are not dashed, and the product 20 is the value of the fraction required.—And in this manner let the pupil be exercised in many examples in this rule till he is perfect in it, because it is of the greatest use of any by abbreviating all arithmetical operations wherever multiplications and divisions are concerned. Where this method is deviated from in any of the following pages of this book, it is not to be understood as done through choice, but only to avoid the trouble and difficulty of procuring the types to express these operations properly in print.

$$\begin{array}{c} 2 \\ 4 \\ 1 \times 3 \times 8 \times 10 \\ \hline 1 \times 2 \times 6 \\ 7 \end{array} = 20$$

EXAMPLES.

EXAMPLES.

$$\frac{2 \times 7 \times 9}{3 \times 2 \times 14} =$$

$$\frac{5 \times 2 \times 6}{3 \times 5 \times 2} =$$

$$\frac{7 \times 18 \times 40 \times 9}{10 \times 9 \times 7 \times 6} =$$

RULE II.

If the fraction must be brought to its least terms at one division, divide its terms by their greatest common measure, which common measure is found by dividing the greater term by the less, and this divisor by the remainder; and so on, always dividing the last divisor by the last remainder, till 1 remain; then is the last divisor the greatest common measure required.

EXAMPLES.

Reduce $\frac{246}{372}$ to its least terms at one division.

First, $246)372(1$

$126)246(1$

$120)126(1$

$$\text{Then } \frac{246 \div 6}{372 \div 6} = \frac{41}{62}$$

The common measure 6)120(20

Reduce $\frac{748}{918}$ to its least terms.

Reduce $\frac{514}{218}$ to its least terms.

Reduce $\frac{5210}{5718}$ to its least terms.

II. To reduce an improper fraction to its equivalent whole or mixt number.

RULE.

Divide the numerator by the denominator, and the quotient will be the integer or mixed number required.

EXAMPLES.

$$\frac{12}{3} = 4.$$

$$\frac{14}{9} = 1 \frac{5}{9}$$

$$\frac{13}{7} = 1 \frac{6}{7}$$

$$\frac{257}{12} = 21 \frac{5}{12}$$

III. To reduce an integer to an equivalent fraction of a given denominator.

RULE.

REDUCTION OF VULGAR FRACTIONS

65

R U L E.

Multiply the integer by the given denominator, and the product will be the numerator required.

E X A M P L E S.

Reduce 7 to a fraction whose denominator shall be 4.

$$7 = \frac{7 \times 4}{4} = \frac{28}{4}.$$

Reduce 5 to a fraction whose denominator shall be 9.

Reduce 13 to a fraction whose denominator shall be 12.

IV. To reduce a mixt number to an equivalent improper fraction.

R U L E.

Multiply the integer by the denominator of the fraction, to the product add the numerator; then the sum written above the denominator will form the fraction required.

E X A M P L E S.

Reduce $2\frac{3}{7}$ to a fraction.

$$2\frac{3}{7} = \frac{2 \times 7 + 3}{7} = \frac{14 + 3}{7} = \frac{17}{7}.$$

Reduce $12\frac{7}{9}$ to a fraction.

Reduce $14\frac{7}{8}$ to a fraction.

V. To reduce a compound fraction to an equivalent simple one.

R U L E.

Multiply all the numerators together for the numerator, and all the denominators together for the denominator of the simple fraction required.

Note. If part of the compound fraction be an integer or a mixt number, reduce it to a fraction by one of the former cases.

E X A M P L E S.

Reduce $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of 5 to a simple fraction.

$$\frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{3}{4} \text{ of } 5 = \frac{1 \times 2 \times 3 \times 5}{2 \times 3 \times 4 \times 1} = (\text{by omitting the common terms } 1, 2, \text{ and } 3) \frac{5}{4}.$$

Reduce $\frac{2}{3}$ of $\frac{5}{8}$ of $3\frac{1}{2}$ to a simple fraction.

Reduce $\frac{2}{7}$ of $\frac{5}{8}$ of $\frac{7}{2}$ of 4 to a simple fraction.

VI. To

VI. To reduce fractions of different denominators to equivalent fractions of a common one.

RULE I.

If the fractions can be conveniently reduced to a common denominator, by multiplying or dividing their terms, according to note 6, page 62, proceed by that method.—But, if not, multiply each numerator continually into all the denominators except its own, for each new numerator; and multiply all the denominators together for the common denominator.

Note. It is evident, that in this and several other operations, when any of the proposed quantities are integers, mixt numbers, or compound fractions, they must be reduced by their proper rules, to the form of simple fractions.

EXAMPLES.

Reduce $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{4}$ to a common denominator.

Thus $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{4} = \frac{12}{24}$, $\frac{16}{24}$, and $\frac{18}{24}$ or $= \frac{6}{12}$, $\frac{8}{12}$,

and $\frac{9}{12}$.

Reduce $\frac{2}{7}$ and $\frac{5}{8}$ to a common denominator.

Reduce $\frac{7}{8}$, $\frac{3}{4}$, and $5\frac{1}{8}$ to fractions of a com. denom.

Reduce $\frac{5}{6}$, $2\frac{1}{3}$, and 4 to fractions of a com. denom.

RULE II.

If the denominators of two given fractions have a common measure, conceive them to be divided by their greatest common measure; then multiply the terms of each given fraction by the quotient arising from the other's denominator.

EXAMPLES.

Reduce $\frac{7}{9}$ and $\frac{4}{15}$ to a common denominator.

Here $\frac{7}{9}$ and $\frac{4}{15} = \frac{7 \times 5}{9 \times 5}$ and $\frac{4 \times 3}{15 \times 3} = \frac{35}{45}$ and $\frac{12}{45}$.

Note. In this last example, and those of the two following rules, the forms $\left(\frac{7 \times 5}{9 \times 5} \text{ and } \frac{4 \times 3}{15 \times 3}\right)$ are printed only to shew, which numbers or quotients are

used in multiplying the terms of the fractions; but I think it quite needless for the Pupil to write down his examples in this way; and I would advise him barely

to write down such an example as the above thus, $\frac{7}{9}$ and $\frac{4}{15} = \frac{35}{45}$ and $\frac{12}{45}$,

and so of others.

Reduce

Reduce $\frac{2}{13}$ and $\frac{3}{20}$ to a common denominator.

Reduce $\frac{3}{14}$ and $\frac{4}{21}$ to a common denominator.

RULE III.

If the less denominator of two fractions divide the greater, multiply the terms of that which hath the less denominator by the quotient.

EXAMPLES.

Reduce $\frac{2}{3}$ and $\frac{5}{12}$ to a common denominator.

Here $\frac{2}{3}$ and $\frac{5}{12} = \frac{2 \times 4}{3 \times 4}$ and $\frac{5}{12} = \frac{5}{12}$ and $\frac{5}{12}$.

Reduce $\frac{2}{3}$ and $\frac{2}{20}$ to a common denominator.

Reduce $\frac{2}{3}$ and $\frac{3}{27}$ to a common denominator.

RULE IV.

When more than two fractions are proposed, by one of the preceding methods, first reduce two of them to a common denominator, and then these and a third, and so on till they be all reduced to their least common denominator,

EXAMPLES.

Reduce $\frac{1}{12}$, $\frac{7}{8}$, and $\frac{5}{24}$ to their least common denom.

By rule 3 we shall have $\frac{1}{12}$, $\frac{7}{8}$, and $\frac{5}{24} = \frac{1 \times 2}{12 \times 2}$, $\frac{7 \times 3}{8 \times 3}$, and $\frac{5}{24} = \frac{2}{24}$, $\frac{21}{24}$, and $\frac{5}{24}$.

Reduce $\frac{3}{7}$, $\frac{4}{15}$, and $\frac{9}{20}$ to the least common denom.

By rule 3, we have $\frac{3}{5}$, $\frac{4}{15}$, and $\frac{9}{20} = \frac{3 \times 4}{5 \times 4}$, $\frac{4}{15}$, and $\frac{9}{20}$
 = (by rule 2.) $\frac{3 \times 4 \times 3}{5 \times 4 \times 3}$, $\frac{4 \times 4}{15 \times 4}$, and $\frac{9 \times 3}{20 \times 3} = \frac{36}{60}$, $\frac{16}{60}$, and $\frac{27}{60}$.

Reduce $\frac{5}{7}$, $\frac{3}{14}$, and $\frac{9}{28}$ to a common denominator.

Reduce $\frac{2}{3}$, $\frac{5}{8}$, and $\frac{7}{12}$ to a common denominator.

Reduce $\frac{7}{7}$, $\frac{3}{3}$, and $\frac{5}{5}$ to a common denominator.

VII. To find the value of proper fractions in numbers of inferior denominations.

RULE.

RULE.

Multiply the numerator by the integer, and divide by the denominator.

EXAMPLES.

1. What is the $\frac{4}{5}$ of 2l. 6s. | 2. Required the value of $\frac{2}{3}$ of 1.
2l. 6s. 2
$$\begin{array}{r} 4 \\ 5 \overline{) 9 \ 4} \\ \underline{5 \ 9} \quad 4 \end{array}$$

Ans. 1l. 16s. 9d. $2\frac{2}{3}$ q.
- $$\begin{array}{r} 20 \\ 3 \overline{) 40} \ (13\text{s. } 4\text{d.} \end{array}$$
 Ans. $\frac{1}{12}$
$$\begin{array}{r} 1 \\ 12 \overline{) 12} \end{array}$$

$$\begin{array}{r} 12 \\ 12 \overline{) 12} \end{array}$$

12 (4d.
3. Required the value of $\frac{3}{8}$ l. - - - - - Ans. 7s. 6d.
4. What is the value of $\frac{4}{13}$ l. - - - - - Ans. 6s. 1d. $3\frac{2}{13}$ q.
5. What is the value of $\frac{2}{9}$ of a guinea? - - - - - Ans. 4s. 8d.
6. What is the value of $\frac{2}{9}$ of a shilling? - - - - - Ans. 9d. $1\frac{1}{9}$ q.
7. What is the value of $\frac{2}{15}$ of 9s. 10 $\frac{1}{2}$ d. - - - - - Ans. 1s. 3d. $3\frac{1}{3}$ q.
8. What is the value of $\frac{1}{4}$ of a lb. troy? - - - - - Ans. 9 oz.
9. What is the value of $\frac{1}{4}$ of a lb. avoirdupois? - - - - - Ans. 12 oz.
10. What is the value of $\frac{1}{16}$ of a cwt. - - - - - Ans. 1 qr. 7 lb.
11. What is the value of $\frac{2}{7}$ of 3 cwt. 1 qr. 14 lb. - - - - -
Ans. 3 qr. 24 lb.
12. What is the value of $\frac{3}{17}$ of a mile? - - - - -
Ans. 1 furlong, 16 pls. 2 yds. 1 f. $9\frac{3}{17}$ in.
13. What is the value of $\frac{6}{7}$ of a yard? - - - - - Ans. 3 qr. $1\frac{3}{7}$ nl.
14. What is the value of $\frac{5}{19}$ of an acre? - - - - -
Ans. 1 rood, $2\frac{2}{19}$ pls.
15. What is the value of $\frac{7}{8}$ of a ton of wine? - - - - -
Ans. 3 hhd. 31 gal. 2 qrts.
16. What is the value of $\frac{2}{15}$ of a hhd. of ale? - - - - -
Ans. 6 gal. $3\frac{1}{3}$ qr.
17. What is the value of $\frac{3}{9}$ of a quarter of corn? - - - - -
Ans. 4 bush. 1 pec. 1 gal. $2\frac{2}{3}$ qr.
18. What is the value of $\frac{3}{10}$ of a day? - - - - - Ans. 7 hrs. 12 min.
19. What is the value of $\frac{1}{7}$ of a month? - - - - - Ans. 2 we. 6 ds.
20. What is the value of $\frac{7}{20}$ of an ell English? - - - - -
Ans. 1 qr. 3 nls.

VIII. To reduce fractions to other equivalent ones of a different integer; a certain number of the less integer being contained in one of the greater.

RULE.

Consider how many of the less integer make one of the greater; and by that number multiply the numerator if the reduction be to a less integer, or the denominator, if to a greater.

EXAMPLES.

Reduce $\frac{2}{9}l.$ to the fraction of a shilling:

$$\frac{2}{9}l. = \frac{2 \times 20}{9}s. = \frac{40}{9}s.$$

Reduce $\frac{40}{9}s.$ to the fraction of a l.

$$\frac{40}{9}s. = \frac{40}{9 \times 20}l. = \frac{2}{9}l.$$

Reduce $\frac{2}{3}l.$ to the fraction of a penny.

Reduce $32d.$ or $\frac{3}{4}d.$ to the fraction of a l.

Reduce $\frac{5}{8}l.$ to the fraction of a farthing.

Reduce $\frac{1600}{7}$ of a farthing to the fraction of a l.

Reduce $\frac{2}{7}$ cwt. to the fraction of a lb.

Reduce $32 lb.$ or $\frac{3}{4} lb.$ to the fraction of a cwt.

Note. If a compound whole number be proposed, reduce it all to the lowest denomination mentioned in it, and proceed as before.

EXAMPLES.

Reduce $7s. 3d.$ to the fraction of a l. - - - Ans. $\frac{143}{100}l.$

Reduce $2\frac{1}{4}d.$ to the fraction of a shilling - - - Ans. $\frac{11}{100}s.$

Reduce $3 qr. 14 lb.$ to the fraction of a cwt. - - - Ans. $\frac{7}{8}$ cwt.

IX. To reduce fractions to equivalent ones of a different integer, when a certain number of the less is not exactly contained in the greater.

RULE.

1. By the last, reduce the given fraction to an equivalent one of such an integer, whereof a certain number are contained in the integer to which the fraction must be brought, or which shall contain a certain number of this.

2. By

2. By the last also, reduce this fraction to an equivalent one of the integer required.

EXAMPLES.

Reduce $\frac{2}{7}$ of a l. to the fraction of a guinea.

$$\frac{2}{7} \text{ l.} = \frac{2 \times 20}{7} \text{ s.} = \frac{2 \times 20}{7 \times 21} \text{ gui.} = \frac{40}{147} \text{ guinea.}$$

Reduce $\frac{2}{3}$ of a crown to the fraction of a guinea.

Ans. $\frac{4}{105}$ l.

Reduce $\frac{40}{147}$ of a guinea to the fraction of a l.

Ans. $\frac{2}{7}$ l.

Reduce $\frac{2}{3}$ of a half-crown to the fraction of a shilling.

Ans. $\frac{2}{3}$ s. or $2\frac{2}{3}$ s.

Reduce $2\frac{1}{2}$ s. to the fraction of a half-crown.

Ans. $\frac{2}{3}$ of a half-crown.

ADDITION OF VULGAR FRACTIONS.

RULE.

REDUCE compound fractions to simple ones, and all to the same integer and denominator if they be different; then the sum of the numerators written over the common denominator will be the sum of the fractions required.

Note. When several fractions are to be collected, it is commonly best first to add those two together which most easily reduce to a common denominator, then their sum and a third, and so on.

EXAMPLES.

1. What is the sum of $\frac{5}{8}$, $7\frac{1}{2}$ and $\frac{1}{3}$ of $\frac{1}{4}$?

$$\frac{5}{8} + 7\frac{1}{2} + \frac{1}{3} \text{ of } \frac{1}{4} = \frac{5}{8} + 7\frac{1}{2} + \frac{1}{12} = \frac{5}{8} + 7\frac{5}{12} + \frac{1}{12} = 7\frac{11}{12} = 8\frac{11}{12} \text{ the sum.}$$

2. What is the sum of $\frac{3}{4}$ and $\frac{4}{5}$? - - - - - Ans. $1\frac{1}{20}$.

3. What is the sum of $\frac{2}{7}$ and $\frac{1}{14}$? - - - - - Ans. $\frac{3}{14}$.

4. What is the sum of $\frac{1}{3}$, $\frac{5}{8}$, and $\frac{1}{6}$? - - - - - Ans. $1\frac{103}{240}$.

5. What is the sum of $\frac{3}{5}$, $\frac{3}{8}$, and $2\frac{1}{10}$? - - - - - Ans. $3\frac{29}{80}$.

6. What is the sum of $\frac{3}{7}$, $\frac{4}{5}$ of $\frac{1}{3}$, and $9\frac{1}{20}$? - - - - - Ans. $10\frac{9}{140}$.

7. What is the sum of $\frac{1}{3}$ of a pound, and $\frac{2}{5}$ of a shilling?

Ans. $\frac{12}{5}$ s. or 13s. 10d. 2 $\frac{2}{5}$ q.

8. What

SUBTRACTION OF VULGAR FRACTIONS. 71

8. What is the sum of $\frac{3}{5}$ and $\frac{1}{5}$ d. Ans. $\frac{4}{5}$ d. or 7d. $1\frac{3}{5}$ q.

9. What is the sum of $\frac{1}{7}$ $\frac{2}{5}$ and $\frac{1}{14}$ d. Ans. $\frac{31}{140}$ s. or 3s. 1d. $1\frac{1}{14}$ q.

10. Suppose that I have $\frac{3}{4}$ of a ship worth 1500l. and that I buy another person's share of her, which is $\frac{5}{8}$; what part of her belongs to me then, and what is it worth?

Ans. I have $\frac{11}{8}$ = 1031l. 5s.

SUBTRACTION OF VULGAR FRACTIONS.

RULE.

THE same preparations being made here as in addition, the difference of the numerators written above the common denominator will be the difference of the fractions required.

Note. In subtracting mixt numbers, when the fraction in the subtrahend is greater than that in the minuend, subtract the numerator of the subtrahend from the denominator, and to the difference add the numerator of the minuend; and carry one to the integer in the subtrahend.

EXAMPLES.

1. What is the difference between $\frac{5}{6}$ and $\frac{1}{6}$?

$$\frac{5}{6} - \frac{1}{6} = \frac{5-1}{6} = \frac{4}{6} = \frac{2}{3} \text{ Ans.}$$

2. What is the difference between $\frac{15}{22}$ and $\frac{11}{17}$?

$$\frac{15}{22} - \frac{11}{17} = \frac{255-242}{17 \times 22} = \frac{13}{374} \text{ Ans.}$$

3. What is the difference between $\frac{3}{12}$ and $\frac{1}{12}$? Ans. $\frac{2}{12}$.

4. What is the diff. between $\frac{3}{13}$ and $\frac{1}{13}$? Ans. $\frac{2}{13}$.

5. What is the diff. between $\frac{1}{2}$ and $\frac{1}{3}$? Ans. $\frac{1}{6}$.

6. What is the diff. between $5\frac{3}{8}$ and $\frac{2}{7}$ of $4\frac{1}{8}$? Ans. $4\frac{1}{8}$.

7. What is the diff. between $\frac{2}{3}$ of a l. and $\frac{2}{3}$ of $\frac{1}{4}$ of a shilling? Ans. $\frac{19}{24}$ s. or 10s. 7d. $1\frac{1}{4}$ q.

8. What is the diff. between $\frac{2}{7}$ of $5\frac{1}{2}$ l. and $\frac{2}{3}$ of a shilling? Ans. $\frac{303}{100}$ l. or 11. 3s $11\frac{1}{3}$ d.

9. Suppose

72 MULTIPLICATION OF VULGAR FRACTIONS.

9. Suppose that I have $\frac{5}{8}$ of a ship which is worth 900l. and that I sell $\frac{3}{4}$ of of my share; what part of her have I left, and what is it worth? - - - - - Ans. $\frac{5}{8} = 187l. 10s.$

MULTIPLICATION OF VULGAR FRACTIONS.

R U L E.

REDUCE mixt numbers, if there be any, to fractions; then multiply all the numerators together for the numerator, and all the denominators together for the denominator of the product required.

Note. A fraction is best multiplied by an integer, by dividing the denominator by it if possible; but if that cannot be done, multiply the numerator by it.

E X A M P L E S.

1. What is the product of $\frac{2}{3}$, $3\frac{1}{4}$, 5, and $\frac{3}{4}$ of $\frac{3}{5}$?

$$\frac{2}{3} \times 3\frac{1}{4} \times 5 \times \frac{3}{4} \text{ of } \frac{3}{5} = \frac{2 \times 13 \times 5 \times 3 \times 3}{3 \times 4 \times 4 \times 5} = \frac{39}{8} = 4\frac{7}{8} \text{ Ans.}$$

2. What is the product of $\frac{2}{7}$ and $\frac{5}{8}$? - - - - - Ans. $\frac{5}{28}$.
3. What is the product of $\frac{4}{15}$ and $\frac{5}{24}$? - - - - - Ans. $\frac{1}{18}$.
4. What is the product of $\frac{3}{5}$, $\frac{4}{9}$, and $\frac{1}{15}$? - - - - - Ans. $\frac{4}{45}$.
5. What is the product of $\frac{1}{2}$, $\frac{2}{3}$, and 3? - - - - - Ans. 1.
6. What is the product of $\frac{3}{4}$, and 7? - - - - - Ans. $1\frac{1}{4}$.
7. What is the product of $\frac{7}{6}$, $\frac{3}{5}$, and $4\frac{5}{14}$? - - - - - Ans. $2\frac{1}{10}$.
8. What is the product of $\frac{5}{6}$, and $\frac{2}{3}$ of $\frac{6}{7}$? - - - - - Ans. $\frac{10}{21}$.
9. What is the product of $5\frac{1}{2}$, and 9? - - - - - Ans. 48.
10. What is the product of 6, and $\frac{2}{3}$ of 5? - - - - - Ans. 20.
11. What is the product of $\frac{2}{9}$ of $\frac{3}{5}$ and $\frac{5}{8}$ of $3\frac{2}{3}$? - - - - - Ans. $\frac{23}{84}$.
12. What is the product of $3\frac{2}{3}$, and $4\frac{1}{3}$? - - - - - Ans. $14\frac{2}{3}$.
13. What is the product of 5, $\frac{3}{4}$, $\frac{2}{7}$ of $\frac{3}{5}$, and $4\frac{1}{2}$? - - - - - Ans. $2\frac{8}{21}$.

DIVISION

DIVISION OF VULGAR FRACTIONS.

R U L E.

HAVING prepared the terms as in multiplication; take the quotient of the numerators and of the denominators, if they will exactly divide, for the numerator and denominator of the fraction required; but if that cannot be done, multiply the dividend by the *reciprocal* of the divisor, for the quotient required,

Note 1. By the reciprocal of a fraction, is meant the fraction got by inverting its terms: so the reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$, and of 5 or $\frac{5}{1}$ is $\frac{1}{5}$.

Note 2. A fraction is divided by an integer by dividing the numerator by it, if possible; but if not, multiply the denominator by it.

E X A M P L E S.

1. What is the quotient of $\frac{25}{9}$ by $\frac{5}{3}$?

$$\frac{25}{9} \div \frac{5}{3} = \frac{25 \div 5}{9 \div 3} = \frac{5}{3} = 1\frac{2}{3} \text{ Anf.}$$

2. What is the quotient of $\frac{5}{9}$ by $\frac{2}{15}$?

$$\frac{5}{9} \div \frac{2}{15} = \frac{5}{9} \times \frac{15}{2} = \frac{5 \times \overset{5}{\cancel{15}}}{\cancel{9} \times 2} = \frac{25}{6} = 4 \text{ Anf.}$$

3. What is the quotient of $\frac{16}{25}$ by $\frac{4}{5}$? - - - Anf. $\frac{8}{5}$.
 4. What is the quotient of $\frac{7}{16}$ by $\frac{3}{4}$? - - - Anf. $\frac{7}{12}$.
 5. What is the quotient of $\frac{14}{9}$ by $\frac{7}{6}$? - - - Anf. $1\frac{1}{3}$.
 6. What is the quotient of $\frac{5}{6}$ by $\frac{15}{7}$? - - - Anf. $\frac{7}{18}$.
 7. What is the quotient of $\frac{12}{35}$ by $\frac{3}{5}$? - - - Anf. $\frac{4}{7}$.
 8. What is the quotient of $\frac{2}{7}$ by $\frac{3}{5}$? - - - Anf. $\frac{10}{21}$.
 9. What is the quotient of $\frac{9}{16}$ by 3 ? - - - Anf. $\frac{3}{16}$.
 10. What is the quotient of $\frac{3}{5}$ by 7 ? - - - Anf. $\frac{3}{35}$.
 11. What is the quotient of 5 by $\frac{7}{10}$? - - - Anf. $7\frac{1}{7}$.
 12. What is the quotient of $7\frac{1}{3}$ by $9\frac{5}{9}$? - - - Anf. $\frac{34}{45}$.
 13. What is the quotient of $\frac{2}{3}$ of $\frac{1}{2}$ by $\frac{5}{7}$ of $7\frac{3}{5}$? Anf. $1\frac{7}{15}$.

74 RULE-OF-THREE IN VULGAR FRACTIONS.

RULE-OF-THREE IN VULGAR FRACTIONS.

R U L E.

HAVING made the necessary preparations for Multiplication, multiply continually together the 2d and 3d terms and the reciprocal of the 1st, for the answer.

E X A M P L E S.

1. If $\frac{3}{8}$ of a yard of velvet cost $\frac{2}{3}$ l. what will $\frac{5}{16}$ of a yard cost?

$$\frac{3}{8} : \frac{2}{5} :: \frac{5}{16} : \frac{5 \times 2 \times 8}{16 \times 8 \times 3} = \frac{1}{3} \text{l.} = 6\text{s. } 8\text{d. Ans.}$$

Note. In this solution, having represented the 4th term in the form of a compound fraction, by expressing the continual product of the 2d term, and 3d term, and reciprocal of the first, as must always be done, then let the terms be always abbreviated as much as possible before the actual multiplication and division; so here the one 5 cancels the other, and the 16 cancels the 2 and the 8, leaving only one third for the simple value of the 4th term required.

2. What will $3\frac{3}{8}$ oz. of silver cost at 6s. 4d. an ounce?

Ans. 1l. 1s. $4\frac{1}{2}$ d.

3. If $\frac{3}{16}$ of a ship be worth 273l. 2s. 6d. what is $\frac{5}{12}$ of her worth?

Ans. 227l. 12s. 1d.

4. What will $13\frac{3}{8}$ lb. cost at the rate of $17\frac{1}{8}$ l. per cwt.

Ans. 2l. $3\frac{3}{4}$ s.

5. What is the purchase of 1230l. bank-stock, at $108\frac{3}{4}$ per cent?

Ans. 1336l. 1s. 9d.

6. What is the interest of 273l. 15s. for a year, at $3\frac{1}{4}$ per cent?

Ans. 8l. 17s. $11\frac{1}{4}$ d.

7. If $\frac{1}{8}$ of a ship be worth 73l. 1s. 3d. what part of her may I buy for 250l. 10s.?

Ans. $\frac{3}{8}$ of her.

8. What must be paid for $5\frac{2}{3}$ oz. at the rate of $5\frac{3}{4}$ s. per lb. troy?

Ans. 2s. $6\frac{1}{2}$ d.

9. How much India-stock may be bought for 3041l. 2s. 3d. at $172\frac{1}{4}$ l. per cent?

Ans. 1760l. 8s. 2d. $3\frac{6}{11}$ q.

10. What does the commission of 530l. 2s. 9d. amount to at 2s. 6d. per cent?

Ans. 13s. $3\frac{3}{8}$ d.

11. How

11. How much Flemish money must be given for 273l. 6s. 8d. sterling, at the rate of 34s. 6d. Flemish per pound sterling? - - - - - Ans. 471l. 10s.

12. How much South-sea-stock, at $111\frac{3}{4}$ per cent. will 10000l. purchase? - - - - - Ans. 8978l. 13s. $6\frac{46}{97}$ d.

13. How much sterling money must be given for 471l. 10s. Flemish, at the rate of 34s. 6d. Flemish for each pound sterling? - - - - - Ans. 273l. 6s. 8d.

RULE-OF-FIVE IN VULGAR FRACTIONS.

RULE.

TAKE the continual product of the three last and the reciprocals of the two first terms, for the answer required.

EXAMPLES.

1. If 2l. 10s. be the wages of 15 men for 6 days, what will be the wages of 12 men for $18\frac{1}{3}$ days?

$$\left. \begin{array}{l} 15 \text{ men} \\ 6 \text{ days} \end{array} \right\} : 5l. :: \left\{ \begin{array}{l} 12 \text{ men} \\ 18\frac{1}{3} \text{ days} \end{array} \right\} : 12 \times \frac{55}{3} \times \frac{5}{2} \times$$

$$\frac{1}{15} \times \frac{1}{6} = \frac{\cancel{12} \times 55 \times 5}{3 \times \cancel{2} \times 18 \times 3} = \frac{55l.}{9} = 6l. 2s. 2d. 2\frac{2}{3}q. \text{ Ans.}$$

Note. In this solution, having put the fourth term required into the form of a compound fraction, it is abbreviated thus: the 12 cancels the 2 and the 6, and the 5 divides the 15, the quotient 3 being placed below it; then there is only 55 left for the numerator, and 3 to multiply by 3, producing 9 for the denominator, of the simple fraction required. And thus let every such question be managed, viz. put the terms of it into the form of a compound fraction, the multipliers all in the numerator, and the divisors in the denominator, after which let this compound fraction be abbreviated as much as possible.

2. What is the interest of 350l. for 18 months, at 5 per cent. per annum? - - - - - Ans. 26l. 5s.

3. If I pay 16s. 4d. for the carriage of $5\frac{1}{4}$ cwt. 20 miles, what must be paid for the carriage of $17\frac{3}{4}$ cwt. $7\frac{1}{2}$ miles? - - - - - Ans. 11l. $8\frac{1}{2}$ d.

4. If a footman travel 273 miles in $6\frac{1}{2}$ days of 12 hours long, in how many days of $9\frac{1}{2}$ hours each may he travel 132 miles? - - - - - Ans. $4\frac{92}{37}$ days.

DECIMAL FRACTIONS.

A Decimal is a fraction whose denominator is 1 with some number of ciphers annexed; as $\frac{1}{10}$, or $\frac{45}{10000}$.

Decimals are written down without their denominators, the numerators being so distinguished as to evince what the denominators are; which is done, by separating, by a point, so many of the right-hand figures from the rest as there are ciphers in the denominator; the figures on the left side of the point being integers, and those on the right decimals: So $\frac{13}{10}$ is written 1.3 and named 1 and 3-tenths; $\frac{15769}{10000}$ is written 15.769, and named 15 and 769 thousandths; and $\frac{250}{10000}$ is written .25, and named 25 hundredths or hundred parts.—But if there be not a sufficient number of figures in the numerator, ciphers are prefixed to supply the defect: So $\frac{1}{100}$ is written .01, that is 1 hundredth; and $\frac{15}{10000}$ thus .0015, that is 15 ten thousandths.

So that the denominator of a decimal is a 1 with as many ciphers as there are figures in the decimal.

Note 1. The 1st, 2d, 3d, 4th, &c. places of decimals, counting from the left-hand towards the right, are denominated the places of primes, seconds, thirds, and fourths, &c. respectively.

2. Ciphers on the right of decimals do not affect their value.

ADDITION AND SUBTRACTION OF DECIMALS.

WRITE the proposed numbers under each other, according to the value of their places, as in whole numbers; in which order the decimal points will stand directly below each other: then add or subtract as in whole numbers, putting a decimal point in the sum or difference straight below the other points.

EXAMPLES in Addition.

1. What is the sum of 276, 39.213, 72014.9, 417, and 5032?

2. What is the sum of 7530, 16.201, 3.0142, 957.13, 6.72819, and .03014?

3. What

MULTIPLICATION of DECIMALS.

77

3. What is the sum of 312.09 , 3.5711 , 4195.6 , 71.498 , 9739.215 , 179 , and $.0027$?
4. What is the sum of $.014$, $.9816$, $.32$, $.15914$, 72913 , and $.0047$?
5. What is the sum of 27.148 , 918.73 , 14016 , 294304 , $.713826$, and 221.7 ?

EXAMPLES in Subtraction.

1. What is the difference between $.9173$ and $.2138$?
2. What is the difference of 1.9185 and 2.73 ?
3. What is the difference of 214.81 and 4.90142 ?
4. What is the difference of 91.713 and 407 ?
5. What is the difference of 2714 and $.916$?

MULTIPLICATION of DECIMALS.

WRITE down the factors, and multiply exactly as in integers, placing the decimal point to the product, so as to make just as many decimals in it as there are in both factors; and if there be not so many figures in the product as there ought to be decimals, prefix ciphers to supply the defect.

EXAMPLES.

1. What is the product of $.417$ and 520.3 ?
2. What is the product of 91.78 and $.381$?
3. What is the product of $.217$ and $.043$?
4. What is the product of 51.6 and 21 ?
5. What is the product of 314 and $.029$?
6. What is the product of $.051$ and $.009$?

CONTRACTIONS.

1. *When decimals are to be multiplied by 1 with any number of ciphers; it is done by only removing the decimal point so many places farther to the right hand as there are ciphers in the multiplier, and subjoining ciphers if need be.*

EXAMPLES.

1. The product of 51.3 and 1000 is 51300 .
2. The product of 2.714 and 100 is

D 3

3. The

3. The product of $\cdot 9163$ and 1000 is
4. The product of $21\cdot 31$ and 10000 is
2. *When the product will contain many more decimals than are necessary for the present purpose, the work may be contracted thus:*

Write the units figure of the multiplier straight under such decimal place of the multiplicand as you intend the last of your product shall be, writing the other figures of the multiplier in an inverted order; then in multiplying reject all the figures in the multiplicand which are on the right of the figure you are multiplying by; writing the products down so, that their right hand figures fall straight below each other; and carrying to such right-hand figures from the product of the two preceding figures in the multiplicand thus, viz. 1 from 5 to 15, 2 from 15 to 25, 3 from 25 to 35, &c. and the sum of the lines will be the product to the number of decimals required, and will be seldom wrong in the last figure.

EXAMPLES.

1. Multiply $27\cdot 14986$ by $92\cdot 41035$, so as to retain only four places of decimals in the product.

Contracted.

$$\begin{array}{r}
 27\cdot 14986 \\
 \underline{53614\cdot 29} \\
 24434874 \\
 542997 \\
 108599 \\
 2715 \\
 81 \\
 14 \\
 \hline
 2508\cdot 9280
 \end{array}$$

Common way.

$$\begin{array}{r}
 27\cdot 14986 \\
 \underline{92\cdot 41035} \\
 13574930 \\
 8144958 \\
 2714986 \\
 10859944 \\
 5429972 \\
 \underline{24434874} \\
 \hline
 2508\cdot 9280650510
 \end{array}$$

2. Multiply $480\cdot 14936$ by $2\cdot 72416$, retaining four decimals in the product.
3. Multiply $2490\cdot 3048$ by $\cdot 573286$, retaining five decimals in the product.
4. Multiply $325\cdot 701428$ by $\cdot 7218393$, retaining three decimals in the product.

DIVISION

DIVISION of DECIMALS.

DIVIDE as in integers; and to know how many decimals must be in the quotient, observe the following rules:

R U L E 1.

The first figure of the quotient must possess the same place of decimals or integers, as doth that figure of the dividend which stands over the units place of the first product.

R U L E 2.

The decimal places of the divisor and quotient together must be equal in number to those of the dividend.—Whence, if the number of decimals in the divisor be taken from the number in the dividend, the remainder will be the number in the quotient.

Note. If, in any case, there be a remainder after all the dividend figures are used, the quotient may be continued to what number of decimals you please by subjoining a cipher continually to the last remainder.

And whenever the number of figures in the quotient are less than the required number of decimals, prefix ciphers to supply the defect.

E X A M P L E S.

$$\begin{array}{r} \cdot 14) 7201\cdot93 (\\ 7\cdot13) \cdot 18 (\end{array} \qquad \begin{array}{r} 3\cdot75) 3\cdot15 (\\ \cdot 215) \cdot 109 (\end{array}$$

C O N T R A C T I O N S.

1. If the divisor be an integer with any number of ciphers at the end, cut them off, and remove the decimal point in the dividend so many places farther to the left as there were ciphers cut off, prefixing ciphers if need be; then proceed as before.

E X A M P L E S.

$$\begin{array}{r} 2170) 45\cdot5 (\\ 21000) 953 (\end{array} \qquad \begin{array}{r} 32000) 41020(\\ 79000) 61 (\end{array}$$

2. Whence, if the divisor be 1 with ciphers, the quotient will be the same figures with the dividend, having the decimal point so many places farther to the left as there are ciphers in the divisor.

DIVISION of DECIMALS.

EXAMPLES.

$$217.3 \div 100 = 2.173$$

$$5.16 \text{ by } 1000 =$$

$$419 \text{ by } 10 =$$

$$.21 \text{ by } 1000 =$$

3. When the number of figures in the divisor is great, the division at large will be very troublesome, but may be contracted thus:

Having by the first general rule found what place of decimals or integers the first figure of the quotient will possess; consider how many figures of the quotient will serve the present purpose; then take the same number of the left-hand figures of the divisor, and so many of the dividend figures as will contain them (less than 10 times); by these find the first figure of the quotient, and for each following figure divide the last remainder by the divisor wanting one figure to the right more than before, but observing what must be carried to the first product for such omitted figures as in the second contraction of multiplication; and continue the operation till the divisor is exhausted.

Note. When there are not so many figures in the divisor as are required to be in the quotient, begin the division with all the figures as usual, and continue it till the number of figures in the divisor and those remaining to be found in the quotient be equal, after which use the contraction.

EXAMPLES.

1. Divide 2508.92806 by 92.41035, so as to have four decimals in the quotient, in which case the quotient will contain six figures.

Contracted.		Common way.	
92.4103,5	2508.928,06 (27.1498	92.4103,5	2508.928,06 (27.1498
	660721		66072106
	13849		13848610
	4608		46075750
	912		91116100
	80		79467850
	6		5539570

2. Divide 4109.2351 by 230.409 so that the quotient may contain four decimals.

3. Divide 37.10438 by 5713.96 that the quotient may contain five decimals.

4. Divide 913.08 by 2137.2 that the quotient may contain three decimals.

REDUC.

REDUCTION OF DECIMALS.

* I. *To reduce a vulgar fraction to an equivalent decimal.*

R U L E.

Divide the numerator by the denominator as in division of decimals, and the quotient will be the decimal required.

E X A M P L E S.

Reduce $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, and $\frac{1}{9}$ to decimals.

Reduce $\frac{2}{7}$ to a decimal.

Reduce $\frac{14}{191}$ to a decimal.

Reduce $\frac{21}{758}$ to a decimal.

II. *To reduce a decimal of a superior denomination to its value in the inferior ones.*

R U L E.

Multiply the given decimal by such a number as will reduce it to the next inferior name, and point off in the product

D 5.

product

* Since to throw any vulgar fraction, whose denominator is a prime number greater than what it is common to divide by in one line, into a decimal, consisting of a great number of figures, has engaged the attention of many eminent persons. I shall here put down the method which Mr. Colson has given in page 162 of Sir Isaac Newton's fluxions; which method performs the work much sooner than any other that I know of.

The method will be best explained by an example, thus: "Suppose, (for instance) I would find the reciprocal of the prime number 29, or the value of the fraction $\frac{1}{29}$ in decimal numbers. I divide 1000 by 29, in the common way, so far as to find two or three of the first figures, or till the remainder becomes a single figure, and then I assume the supplement to complete the quotient. Thus I shall have $\frac{1}{29} = 0.03448\frac{8}{29}$ for the complete quotient; which equation if I multiply by the numerator 8 it will give $\frac{8}{29} = 0.27586\frac{4}{29}$ or rather $\frac{8}{29} = 0.27586\frac{6}{29}$. I substitute this instead of the fraction in the first equation, and I shall have $\frac{1}{29} = 0.0344817586\frac{6}{29}$. Again I multiply this equation by 6, and it will give $\frac{6}{29} = 0.2068965517\frac{7}{29}$, and then by substitution $\frac{1}{29} = 0.03448175862068965517\frac{7}{29}$. Again, I multiply this equation by 7, and it becomes $\frac{7}{29} = 0.24137931034482758620\frac{10}{29}$, and then by substitution $\frac{1}{29} = 0.0344817586206896551724137931034482758620\frac{10}{29}$, where every operation will at least double the number of figures found by the preceding operation. And this will be an easy expedient for converting division into multiplication in all cases. For this reciprocal of the divisor being thus found, it may be multiplied into the dividend to produce the quotient."

product as many places of decimals as are in the given number; then reduce these in the same manner to the next name, and continue the reduction to the lowest name required, or till the decimals pointed off be all ciphers; then the numbers on the left of the points will express the value of the decimal.

EXAMPLES.

1. What is the value of $\cdot 7751$? - - - Ans. 15s. 6d.
2. What is the value of $\cdot 625$ shil? - - - Ans. $7\frac{1}{2}$ d.
3. What is the value of $\cdot 86351$? - - - Ans. 17s. 3 \cdot 24d.
4. What is the value of $\cdot 0125$ lb. troy? - - - Ans. 3 dwts.
5. What is the value of $\cdot 4694$ lb. troy?
Ans. 5 oz. 12 dwt. 15 \cdot 744 gr.
6. What is the value of $\cdot 625$ cwt? - - - Ans. 2 qr. 14 lb.
7. What is the value of $\cdot 009943$ miles?
Ans. 17 yd. 1 ft. 5 \cdot 98848 inc.
8. What is the value of $\cdot 6875$ yd? - - - Ans. 2 qr. 3 nls.
9. What is the value of $\cdot 3375$ acr? - - - Ans. 1 rd. 14 poles
10. What is the value of $\cdot 2083$ hhd. of wine?
Ans. 13 \cdot 1229 gal.
11. What is the value of $\cdot 40625$ qr. of corn?
Ans. 3 bush. 1 peck.
12. What is the value of $\cdot 42857$ month?
Ans. 1 we. 4 ds. 23 \cdot 99904 hrs.

III. *To reduce integers or decimals to equivalent decimals of superior denominations.*

CASE I.

If a simple number or decimal be proposed, reduce it to the name required by dividing as in reduction of integers.

EXAMPLES.

1. Reduce 1 dwt. to the decimal of a lb.
Ans. $\cdot 004166$ &c. lb.
2. Reduce 9d. to the decimal of a pound. Ans. $\cdot 03751$.
3. Reduce 7 drams to the decimal of a lb. avoird.
Ans. $\cdot 02734375$ lb.
4. Reduce $\cdot 26$ d. to the decimal of a l.
Ans. $\cdot 0010833$ &c. l.
5. Reduce

5. Reduce 2.15 lb. to the decimal of a cwt.
Ans. .019196 $\frac{1}{4}$ cwt.
6. Reduce 24 yards to the decimal of a mile.
Ans. .013636 &c. miles.
7. Reduce .056 poles to the decimal of an acre.
Ans. .00035 acr.
8. Reduce 1.2 pints of wine to the decimal of a hhd.
Ans. .00238 $\frac{1}{4}$ hhd.
9. Reduce 14 minutes to the decimal of a day.
Ans. .009722 &c. da.
10. Reduce .21 pints to the decimal of a peck.
Ans. .013125 pec.

CASE 2.

A compound number may be reduced to a superior name by reducing each of its parts, and taking the sum of the decimals; the best way to do which is thus:

Write the given numbers under each other, proceeding orderly from the least to the greatest name, for dividends; draw a perpendicular line on the left of these, and on the left of it write opposite to each dividend such a number, for a divisor, as will reduce it to the next superior name; then begin with the upper division, and affix the quotient of each to the next dividend, as a decimal part of it, before it be divided, and the last sum will be the answer.

EXAMPLES.

1. Reduce 3l. 12s. 6 $\frac{1}{4}$ d. to the denomination of pounds.

$$\begin{array}{r|l}
 4 & 3 \\
 12 & 6.75 \\
 20 & 12.5625 \\
 & 3.628125 \text{ Ans.}
 \end{array}$$

2. Reduce 19l. 17s. 3 $\frac{1}{4}$ d. to l.

Ans. 19.86334166 &c. l.

3. Reduce 15s. 6d. to the decimal of l. Ans. .775l.

4. Reduce 7 $\frac{1}{2}$ d. to the decimal of a shil. Ans. .625s.

5. Reduce 5 oz. 12 dwts. 16 gr. to lbs.

Ans. .46944 &c. lb.

6. Reduce 3 cwt. 2 qr. 14 lb. to cwts. Ans. 3.625 cwt.

7. Reduce 17 yd. 1 ft. 6 in. to the decimal of a mile.

Ans. .0099431818 &c. mil.

D 6

8. Reduce

8. Reduce 2 qr. 3 nls. to the decimal of a yard. Ans. .6875 yd.
 9. Reduce 13 ac. 1 ro. 14 pol. to acres. Ans. 13.3375 acr.
 10. Reduce 13 gal. 1 pint of wine to the decimal of a hhd. Ans. .20833 &c. hhd.
 11. Reduce 3 bush. 1 peck to the decimal of a quarter. Ans. .40625 qr.
 12. Reduce 3 mon. 1 we. 5 da. to months. Ans. 3.42857 + mon.

RULE-OF-THREE IN DECIMALS.

REDUCE vulgar fractions to decimals, and compound numbers either to decimals of the higher names, or to integers of the lower, as also the first and third to the same name: Then state the question and proceed as in integers.

Note. Any of the convenient examples in the rule-of-three or rule-of-five in integers, or vulgar fractions, may be taken as proper examples to the same rules in decimals; for it would be filling the Book to ill purpose to give different examples here.—The following example, which is the first in vulgar fractions, is wrought here to shew the method.

If $\frac{2}{3}$ of a yard of velvet cost $\frac{2}{3}$ l. what will $\frac{5}{16}$ yd. cost?

	yd	1	yd	1	s	d
$\frac{2}{3} = .375$	$.375$	$:$	4	$::$	$.3125$	$:$
					$.333$	&c. or 6 8
					4	
$\frac{2}{3} = .4$			$.375$	$)$	$.12500$	$(.333333$ &c.
					1250	20
$\frac{5}{16} = .3125$					125	s. 6.66660 &c.
					12	
Ans, 6s. 8d:					d. 7.99999	&c. = 8d.

Note. The remainder in the division being always the same, the quotient figure must be so likewise; so that if the quotient were infinitely continued it would be equal to $\frac{2}{3}$ l. as in vulgar fractions,

RULE-

THE same preparations must be used here as in the rule-of-three before the stating, after which proceed as in integers.

1. If 2l. 10s. be the wages of 15 men for 6 days, what will be the wages of 12 men for $18\frac{1}{2}$ days?

$$\frac{15}{6} \left. \vphantom{\frac{15}{6}} \right\} : 2.5 :: \left\{ \frac{18.333}{12} \right\} : 6.111 \text{ \&c. or } 6 \frac{2}{3}$$

$$\begin{array}{r} 90 \\ 220 \\ \hline 215 \\ 110 \\ \hline 44 \end{array}$$

90) 550.0
£.6.111111- &c.

Anf. 6l. 2s. 2 $\frac{1}{2}$ d.

$$\begin{array}{r} \text{20} \\ \hline \text{s. } 2 \cdot 2222 \\ \text{12} \\ \hline \text{d. } 2 \cdot 6666 \\ \text{4} \\ \hline \text{q. } 2 \cdot 6666 \end{array}$$

For more examples, take any of those in the rule-of-five in vulgar fractions or whole numbers.

SIMPLE INTEREST.

INTEREST is the premium allowed for the loan of money.

The sum lent is called the *principal*.

The sum of the principal and interest is called the amount.

Interest

Interest is allowed at so much *per cent. per annum*, which premium *per cent. per annum*, or interest of 100l. for a year, is called the rate of interest.

Interest is of two sorts, *simple* and *compound*.

Simple interest is that which is allowed for the principal lent only.

Note. The rules for simple interest serve also to calculate commission, brokerage, insurance, stocks, or any thing else rated at so much *per cent*.

RULES.

I. *To find the interest for a year*, multiply the principal by the rate, and divide the product by 100.

Note. When the rate is a convenient aliquot part of a 100, or can be divided into several such parts of 100, take the same part or parts of the principal for the interest of a year.

EXAMPLES.

1. What is the interest of 450l. for a year, at 5 per cent. per annum? - - - - - Ans. 22l. 10s.
2. What is the interest of 230l. 10s. at 4 per cent. per annum? - - - - - Ans. 9l. 4s. 4d. $3\frac{1}{3}q$.
3. What is the interest of 715l. 12s. 6d. at $4\frac{1}{2}$ per cent. per annum? - - - - - Ans. 32l. 4s. $c\frac{3}{4}d$.

II. *To find the interest for several years*, multiply the interest of one year by the number of them.

Note. When there are several years, or several years with some parts of a year, it is commonly best to multiply them by the rate, and divide the product into aliquot parts of 100, taking the same parts of the principal for the answer.

EXAMPLES.

1. What is the interest of 720l. for 3 years, at 5 per cent. per annum? - - - - - Ans. 108l.
2. What is the interest of 355l. 15s. for 4 years, at 4 per cent. per annum? - - - - - Ans. 56l. 18s. 4d. $3\frac{1}{3}q$.
3. What is the interest of 32l. 5s. 8d. for 7 years, at $4\frac{1}{4}$ per cent. per annum? - - - - - Ans. 9l. 12s. $1\frac{3}{10}d$.

III. *If there be any parts of a year, as $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, &c.* the interest for them is found by taking the same parts of one year's interest, when it is not convenient to use the note in the last case.

EXAMPLES.

1. What is the interest of 170l. for $1\frac{1}{2}$ year, at 5 per cent. per annum? - - - - - Ans. 12l. 15s.
2. What

SIMPLE INTEREST.

87

2. What is the Interest of 205l. 15s. for $\frac{1}{4}$ of a year, at 4 per cent. per annum? - - - - - Ans. 2l. 1s. 1d. $3\frac{1}{3}$ q.

3. What is the interest of 319l. 6d. for $5\frac{3}{4}$ years at $3\frac{3}{4}$ per cent. per annum? - - - - - Ans. 68l. 15s. 9d. $2\frac{7}{10}$ q.

IV. For any number of days, multiply the interest of a year by them, and divide by 365.

A TABLE showing the number of days from any day of one month to the same day of any other month.

From any day of												
☾	Jan.	Feb.	Ma.	Ap.	May	June	Jul.	Aug.	Ser.	Oct.	No.	Dec.
Jan.	365	334	306	275	245	214	184	153	122	92	61	31
Feb.	31	365	337	306	276	245	215	184	153	23	92	62
Mar	59	28	365	324	304	273	243	212	181	151	120	90
Apr.	90	59	31	365	335	304	274	243	212	182	151	121
May	120	89	61	30	365	334	304	273	242	212	181	151
June	151	120	92	61	31	365	335	304	273	243	212	182
July	181	150	122	91	61	30	365	334	303	273	242	212
Aug.	212	181	153	122	92	61	31	365	334	304	273	243
Sep.	243	212	184	153	123	92	62	31	365	335	304	274
Oct.	273	242	214	183	153	122	92	61	30	365	334	304
Nov	304	273	245	214	184	153	123	92	61	31	365	335
Dec.	334	303	275	244	214	183	153	122	91	61	30	365

Note. In leap year, if the end of the month of February be in the time, one day must be added on that account.

EXAMPLES.

1. What is the interest of 107l. for 117 days, at $4\frac{3}{4}$ per cent. per annum? - - - - - Ans. 1l. 12s. $7\frac{8}{13}\frac{1}{3}$ d.

2. What is the amount of 120l. from Jan. 7, to Sept. 12, 1777, at 4 per cent. per annum? Ans. 123l. 5s. 2d $2\frac{334}{365}$ q.

3. What is the interest of 213l. from Feb. 12, to June 5, 1776, it being leap year, at $3\frac{1}{2}$ per cent. per annum?

Ans. 2l. 6s. 6d. $3\frac{501}{1825}$ q.

N. B. The following is a neat and concise method for working simple interest for any number of days, at any rate of interest.

Numb,

Numb.	l	s	d	q	Nu.	l	s	d	q	Nu.	d	q
1000000	2739	14	6	0.99	3000	8	4	4	2.41	5	3	1.15
900000	2465	15	0	3.29	2000	5	9	7	0.27	4	2	2.52
800000	2191	15	7	1.59	1000	2	14	9	2.44	3	1	3.89
700000	1917	16	1	3.89	900	2	9	3	3.12	2	1	1.26
600000	1643	16	8	2.19	800	2	3	10	0.11	1	0	2.63
500000	1369	17	3	0.49	700	1	18	4	1.10	0.9	0	2.37
400000	1095	17	9	2.79	600	1	12	10	2.08	0.8	0	2.10
300000	821	18	4	1.10	500	1	7	4	3.07	0.7	0	1.84
200000	547	18	10	3.40	400	1	1	11	0.05	0.6	0	1.58
100000	273	19	5	1.70	300	0	16	5	1.04	0.5	0	1.32
90000	246	11	6	0.33	200	0	10	11	2.03	0.4	0	1.05
80000	219	3	6	2.96	100	0	5	5	3.01	0.3	0	0.79
70000	191	15	7	1.59	90	0	4	11	0.71	0.2	0	0.53
60000	164	7	8	0.22	80	0	4	4	2.41	0.1	0	0.26
50000	136	19	8	2.85	70	0	3	10	0.11	0.09	0	0.24
40000	109	11	9	1.48	60	0	3	3	1.81	0.08	0	0.21
30000	82	3	10	0.11	50	0	2	8	3.51	0.07	0	0.18
20000	54	15	10	2.74	40	0	2	2	1.21	0.06	0	0.16
10000	27	7	11	1.37	30	0	1	7	2.90	0.05	0	0.13
9000	24	13	1	3.23	20	0	1	1	0.60	0.04	0	0.11
8000	21	18	4	1.10	10	0	0	6	2.30	0.03	0	0.08
7000	19	3	6	2.96	9	0	0	5	3.67	0.02	0	0.05
6000	16	8	9	0.82	8	0	0	5	1.04	0.01	0	0.03
5000	13	13	11	2.68	7	0	0	4	2.41			
4000	10	10	2	0.55	6	0	0	3	3.78			

RULE.

Multiply the principal by the rate, both in pounds; multiply the product by the number of days, and divide this last product by 100; then take from the table the several sums which stand opposite the several parts of the quotient, and adding them together will give the interest required.

EXAMPLES.

1. What is the interest of 225l. 10s. for 23 days, at $4\frac{1}{2}$ per cent. per annum?

princ. 225.5		l	s	d	q
rate 4.5	against 200 is	0	10	11	2.03
		30	—	0	1 7 2.90
		3	—	0	0 1 3.89
1014.74		0.3	—	0	0 0 0.79
75 days 23		0.09	—	0	0 0 0.24
100)23339.25					
233.3925	Then in the table				

Ans. 0 12 9 1.85 true
in the last place of decimals.

2. What

2. What is the interest of 17l. 5s. for 117 days, at $4\frac{1}{2}$ per cent. per annum? - - - - - Anf. 5s. 3d. 0'12q.
3. What is the interest of 112l. 12s. 6d. from the 8th of May, to the 3d of November, at 4 per cent. per annum? Anf. 2l. 4s. 2d. 0'92q.

QUESTIONS

Concerning *brokerage, commission, insurance, and stocks.*

Brokerage is the allowance made to brokers for assisting others in buying or disposing of their goods.

Factorage, provision, or commission, is an allowance made to factors or agents beyond sea, for buying or selling of goods for their employers.

Insurance is security given, in consideration of a premium paid down, to restore, to a certain value for which the premium is advanced, the loss or damage on ships, houses, goods, &c. by storms, fire, &c. But in the calculations, the word *insurance* is commonly written for premium.

Stocks are the public funds of the nation; the shares of which being transferrable from one person to another, occasion the extensive business, or worst kind of gaming, called stock-jobbing.

EXAMPLES.

1. What is the brokerage of 610l. at 5s. or $\frac{1}{4}$ per cent? Anf. 1l. 10s. 6d.
2. What is the brokerage of 372l. 7s. 4d. at 4s. 6d. per cent? - - - - - Anf. 16s. 9 $\frac{12}{100}$ d.
3. What is the factorage of 920l. at $3\frac{1}{2}$ per cent? Anf. 32l. 4s.
4. What is the commission of 568l. 17s. 10d. at $1\frac{1}{2}$ per cent? - - - - - Anf. 7l. 12s. 8 $\frac{1}{100}$ d.
5. What is the insurance of 900l. at $10\frac{3}{4}$ per cent? Anf. 96l. 15s.
6. What is the insurance of 712l. 6s. for 8 months, at $7\frac{1}{2}$ per cent. per annum? - - - - - Anf. 35l. 12s. 3d. 2 $\frac{3}{4}$ q.
7. What is the purchase of 1200l. south-sea stock, at $103\frac{3}{8}$ per cent? - - - - - Anf. 1243l 10s.
8. What is the purchase of 912l. 14s. bank-stock, at $127\frac{3}{4}$ per cent. - - - - - Anf. 1165l. 19s. 5d. 3 $\frac{7}{100}$ q.
9. What

9. What is the purchase of 2380l. India-stock, at 147 $\frac{1}{2}$ per cent. - - - - - Ans. 3504l. 11s.

10. What is the purchase of 816l. 12s. bank annuities, at 89 $\frac{3}{4}$ per cent? - - - - - Ans. 729l. 16s. 8d. 2 $\frac{1}{4}$ q.

COMPOUND INTEREST.

COMPOUND interest is that which is allowed, not only for the sum lent, but also for its interest; as it becomes due at the end of each stated time of payment.

R U L E S.

I. Find the amount of the given principal for the time of the first payment, by simple interest; then consider this amount as the principal for the second payment, whose amount calculate in the same manner; and so on through all the payments, still accounting the last amount as the principal of the next payment. *Or,*

II. Find the amount of one pound for the time of the first payment, and multiply it by itself so often as are the number of payments wanting 1, that is, twice by itself if there be three payments, thrice if there be four, &c. then the last product multiplied by the principal gives the whole amount.

Note 1. The following table, adapted for the use of the second rule, contains the amount of 1 pound for each of the first 10 years or payments, at seven several rates of interest, from 2 and a half to 6 per cent. and therefore any one of these numbers multiplied by a given sum, produces its amount for the corresponding rate and time.

No.	2 $\frac{1}{2}$	3	3 $\frac{1}{2}$	4	4 $\frac{1}{2}$	5	6
1	1.025	1.03000	1.03500	1.04000	1.04500	1.05000	1.06000
2	1.05062	1.06090	1.07122	1.08160	1.09202	1.10250	1.12360
3	1.07689	1.09273	1.10872	1.12486	1.14117	1.15762	1.19102
4	1.10381	1.12551	1.14752	1.16986	1.19252	1.21551	1.26248
5	1.13141	1.15927	1.18769	1.21665	1.24618	1.27628	1.33823
6	1.15969	1.19405	1.22926	1.26532	1.30226	1.34010	1.41852
7	1.18869	1.22987	1.27228	1.31593	1.36086	1.40710	1.50363
8	1.21840	1.26677	1.31681	1.36857	1.42210	1.47746	1.59385
9	1.24886	1.30477	1.36290	1.42331	1.48610	1.55133	1.68948
10	1.28008	1.34392	1.41060	1.48024	1.55297	1.62889	1.79085

Note 2. It is not necessary that the payments should be yearly, for the rule will hold whether they be yearly, half yearly, quarterly, monthly, or any other aliquot part of a year; but there must be a complete integer number of the times of payments, not a certain number of times and part of another, for the rule takes no notice of such parts, nor will it be just to calculate for a complete time and take the same part of the result as is the part of the time; but in this manner have some authors falsely calculated some of their examples. It is possible to perform all such calculations, both parts of times and whole ones, without logarithms, though the trouble is, in some cases, intolerable: but by the logarithms it is as easy to perform the calculations with parts of times of payments, as with whole ones.

EXAMPLES.

1. What will 50l. amount to in 5 years, at 5 per cent. per annum, compound interest? - Ans. 63l. 16s. $3\frac{1}{4}$ d.
2. What will 50l. supposing the interest payable half-yearly, amount to in 5 years, or 10 half-years, at 5 per cent per annum, compound interest? - - Ans. 64l. 1d.
3. What will 50l. the interest payable quarterly, amount to in 5 years, at 5 per cent. per annum compound interest? Ans. 64l. 2s. $0\frac{1}{4}$ d.
4. What is the compound interest of 370l. forborn 6 years, at 4 per cent. per annum? - - - - Ans. 98l. 3s. $4\frac{1}{4}$ d.
5. What is the compound interest of 410l. forborn $2\frac{1}{2}$ years, at $4\frac{1}{2}$ per cent. per annum, supposing the interest payable half-yearly? - - - - Ans. 48l. 4s. $11\frac{1}{4}$ d.
6. What is the amount of 217l. forborn $2\frac{1}{2}$ years, at 5 per cent. per annum, supposing the interest payable quarterly? Ans. 242l. 13s. $4\frac{1}{4}$ d.

DISCOUNT.

REBATE or *Discount* is the difference between a sum of money due at a certain time to come, and its present worth.

The *present worth* of any sum or debt, due some time hence, is such a sum, as if put to interest, would in the time and at the rate for which the discount is to be made, amount to the sum or debt then due.

RULE.

As the amount of 100l. for the given rate and time :
Is to the given sum or debt : :
So is 100l. or the interest of 100l. for the given time :
To the present worth, or to the discount of the given
sum respectively.

Note,

Note 1. The meaning of four things written in the form above, is that they are the four terms of a rule of three question.

2. "The method used among bankers, &c. in discounting bills, is to find the interest of the sum drawn for, from the time the bill is discounted to the time when it becomes due, (including the days of grace) which interest they reckon as the discount, thereby making the discount more than it really is."

But when goods are bought or sold, and discount is to be made for present payment, at any rate per cent. without regard to time, the interest of the sum as calculated for a year is the discount.

E X A M P L E S.

1. What is the present worth of 700l. due 9 months hence, discount at 5 per cent. per annum?

Ans. 674l. 13s. 11d. $2\frac{7}{8}\frac{1}{2}q.$

2. What is the discount of 312l. for 6 months, at 6 per cent. per annum? - - - - - Ans. 9l. 1s. 8d. $3\frac{9}{16}\frac{1}{2}q.$

3. What is the rebate of 125l. 10s. payable 10 months hence, at $4\frac{1}{2}$ per cent. per annum?

Ans. 4l. 10s. 8d. $2\frac{5}{8}\frac{3}{4}q.$

4. What is 217l. 4s. 6d. due 5 months hence, worth in present money, discount at $5\frac{1}{2}$ per cent?

Ans. 212l. 7s. $2\frac{1}{4}\frac{1}{8}d.$

5. How much ready money for a note of 73l. due 17 months hence, discount at 5 per cent. per annum?

Ans. 68l. 3s. $5\frac{2}{3}\frac{3}{4}d.$

6. Sold goods to the amount of 83l. 6s. to be paid 6 months hence? what must I have in present money, discount at 8 per cent. per annum? - - - - - Ans. 80l. 1s. $11\frac{1}{3}\frac{1}{4}d.$

7. Bought goods to the value of 35l. 8s. to be paid 8 months hence; what must I pay in present money, discount at 7 per cent. per annum? - - - - - Ans. 33l. 16s. $5\frac{3}{4}\frac{1}{2}d.$

8. If a legacy of 600l. is left me on the 3d of May, to be paid on the Christmas day following; what must I receive, when I allow 5 per cent per annum discount for present payment? - - - - - Ans. 581l. 4s. 2d. $1\frac{1}{2}\frac{2}{3}\frac{1}{4}q.$

9. What is the present worth of 60l. payable at two 3 months, at 5 per cent. per annum discount?

Ans. 58l. 17s. 11d. $2\frac{2}{3}\frac{2}{3}\frac{1}{2}q.$

10. What is the present worth of 120l. payable as follows, viz. 50l. at three months, 50l. at 5 months, and the rest at 8 months, discount at 6 per cent. per annum?

Ans. 117l. 5s. $5\frac{1}{4}d.$

EQUATION OF PAYMENTS.

EQUATION of payments is the finding a time, when if a sum of money be paid which is equal to the sum of several others due at different times, no loss will be sustained by either party.

*The * common rule is to*

Multiply each payment by the time it is due at, then dividing the sum of the products by the sum of the payments, the quotient is the equated time.

* The true rule for two payments is this:

If p be the first payment, and t the time till it be due; also P = any other payment, and T = its time; moreover if r be one year's interest of 1l. put $a = T + t + \frac{P+p}{pr}$, and $c = Tt + \frac{PT+pt}{pr}$; then $\frac{1}{2}a \pm \frac{1}{2}\sqrt{a^2-4c}$ is the equated time for these two payments.

Or if t be taken = 0, then is $a = T + \frac{P+p}{pr}$, and $c = \frac{PT}{pr}$, T being then the difference between the two times of payment; these values of a and c being used in the same theorem $\frac{1}{2}a \pm \frac{1}{2}\sqrt{a^2-4c}$, it will determine how long after the first payment is due, the whole, or sum of the two must be paid.

This rule is the industrious Mr. *Malcolm's*.—*Kersey's* rule, which several have given as the true method of computing equation of payments, is false; otherwise it would bring out the same answer as *Malcolm's*, against the truth of whose rule for only two payments I believe no objection was ever made; but as they bring out different answers when simple interest is used (and it does not appear that the authors of them proposed to use any other) they cannot both of them be true.

When 3 or more payments are to be equated for, then *Malcolm's* method of first equating for two, and next for their result and a third, &c. is not strictly true. But in all such cases, to obtain the just answer, *Malcolm's* general principle of solution ought to be used, viz making the interests of the sums that are kept till after they are due, equal to the discounts of those which are paid before they are due. The resolution of the resulting equation will indeed require some knowledge in Algebra. But for ordinary use, the common rule will bring out answers sufficiently near the truth.

EXAMPLES.

E X A M P L E S.

1. There is a debt of 60l. to be paid, 30l. at 2 months, and 30l. at 4 months; but if it be reduced to one payment, at what time must it be made? - Anf. at 3 months.
2. A debt of 120l. due as follows, viz. 50l. at 2 months, 40l. at five months, and the rest at 7 months; when must the whole be paid? - - - - - Anf. at $4\frac{1}{4}$ mo.
3. A debt of 500l. is to be discharged thus, viz. 100l. present, 300l. at 4 months, and the rest at 6 months: what is the equated time for the whole? - Anf. $3\frac{3}{5}$ mo.
4. A debt is to be discharged by paying $\frac{1}{2}$ at 3 months, $\frac{1}{3}$ at 5 months, and the rest at 6 months: what is the equated time for the whole? - - - - - Anf. $4\frac{1}{8}$ mo.
5. A debt is to be discharged thus, viz. $\frac{1}{4}$ present, and $\frac{1}{4}$ every 3 months after, till the whole be discharged: what is the equated time for the whole? - - - Anf. $4\frac{1}{2}$ mo.

S I N G L E F E L L O W S H I P.

SINGLE Fellowship is a rule by which any number may be divided into any assigned number of parts, which shall be proportional to so many other proposed numbers, each to each.

By this rule are adjusted the gain or loss or charges of merchants in company, the effects of bankrupts, legacies in case of a deficiency of assets, &c.

R U L E.

Make the sum of the numbers, to which the required parts must be proportional, the first term; the number to be parted or divided, the second; and each of the given numbers, to which the required ones must be proportional, the several third terms of so many rule of three questions; the fourth terms of which will be the respective parts required.

Note 1. The first and third contractions of the rule-of-three are the best for working questions in this rule; because the two first terms of all the statings being the same, there will be had a constant multiplier or divisor for the third terms.

2. When two or more of the terms, to which the required ones must be proportional, are equal, so many operations will be saved as there are equalities.

E X A M P L E S.

EXAMPLES.

1. Divide the number 120 into 3 such parts as shall be to each other as 1, 2, and 3. - - Anf. 20, 40, and 60.

2. Two merchants, A and B, trade together; A puts into the stock 60l. and B puts in 40l. and gain by trading 24l. what are their shares of it?

Anf. A's share is 14l. 8s. and B's 9l. 12s.

3. Two merchants, C and D, made a stock of 120l. whereof C contributed 75l. by trading they lost 30l. what must each sustain of it?

Anf. C 18l. 15s. and D 11l. 5s.

4. Three merchants, whose stock is 700l. whereof E contributed 123l. F. 358l. and G. the rest, gain by trading 125l. 10s. what must each have of it?

Anf. E must have 22l. 1s. 0d, $2\frac{2}{3}q$.

F - - 64 3 8 $0\frac{32}{3}$

G - - 39 5 3 $1\frac{1}{3}$

5. Three merchants, H, I, and K, freighted a ship with 340 tuns of Wine, whereof H loaded 110 tuns, I 97, and K the rest; in a storm the seamen were obliged to throw overboard 85 tuns: how much must each sustain of the loss?

Anf. H $27\frac{1}{2}$, I $24\frac{1}{4}$, and K $33\frac{1}{4}$ tuns.

6. A piece of ground consising of 37 ac. 2 ro. 14 ps. is to be divided among three persons, L, M, and N, in proportion to their estates: now if L's estate be worth 500l. a year, M's 320l. and N's 75l. what quantity of land must each one have?

Anf. L must have 20 ac. 3 ro. $39\frac{138}{175}ps$.

M - - 13 1 $30\frac{46}{175}$

N - - 3 0 $23\frac{173}{175}$

7. A person is indebted to O 57l. 15s. to P 108l. 3s. 8d. to Q 22l. 10d. and to R 73l. but at his decease, his effects are found to be worth no more than 170l. 14s. how must it be divided among his creditors?

Anf. O must have 37l. 15s. 5d. $2\frac{5302}{10439}q$.

P - - 70 15 2 $2\frac{7498}{10439}$

Q - - 14 8 4 $0\frac{4720}{10439}$

R - - 47 14 11 $2\frac{3358}{10439}$

8. A ship worth 900l. being entirely lost, of which $\frac{7}{8}$ belonged to S, $\frac{1}{4}$ to T, and the rest to V; what loss will each sustain, supposing 540l. of her was insured?

Ans. S will lose 45l. T 90l. and V. 225l.

9. Four persons, W, X, Y, and Z, spent among them 25s. and agree that W shall pay $\frac{1}{2}$ of it, X $\frac{1}{3}$, Y $\frac{1}{4}$, and Z $\frac{1}{5}$; that is, their shares are to be in proportion as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$; what are their shares?

Ans. W must pay 9s. 8d. $3\frac{4}{7}$ q.

X - - 6 5 $3\frac{3}{7}$

Y - - 4 10 $1\frac{5}{7}$

Z - - 3 10 $3\frac{1}{7}$

DOUBLE FELLOWSHIP.

WHEN the shares of partners are continued in company unequal times, they occasion the name *fellowship with time*, or *double fellowship*: which is performed by the following

R U L E . *

Multiply each share by the time of its continuance, then divide the gain or loss in proportion to the products, as in single fellowship, by saying, as the sum of the products is to the whole gain or loss, so is each product, to each part of it.

E X A M P L E S .

1. A. had in company 50l. for 4 months, and B. 60l. for 5 months: at the end of which they find 24l. gained: how must it be divided between them?

Ans. A. must have 9l. 12s. and B. 14l. 8s.

2. A ship's company take a prize of 1000l. which they agree to divide among them according to their pay and

* Mr. Ward has given an analytical investigation of this rule, and Mr. Malcolm has given the reason of it in a manner evident enough; but I think the most general and elegant manner of proof is thus:

When the times are equal, the shares of the gain or loss are evidently as the stocks, as in single fellowship; and when the stocks are equal, the shares are as the times; wherefore when neither are equal, the shares must be as their products.

and the time they have been on board: now the officers and midshipmen have been on board 6 months, and the sailors 3 months; the officers have 40s. a month, the midshipmen 30s. and the sailors 22s. a month; moreover there are 4 officers, 12 midshipmen, and 110 sailors: what will each man's share be?

Ans. each officer must have 23l. 23s. 5d. $0\frac{92}{173}q.$

- midship. - - 17 6 9 $3\frac{69}{173}$

- seaman, - - 6 7 2 $0\frac{8}{173}$

3. A, B, and C have a pasture in common, for which they pay 30l. per annum; into which A put 7 cows for 3 months, B 9 cows for 5 months, and C 4 cows for 12 months; what must each pay of the rent?

Ans. A must pay 5l. 10s. 6d. $1\frac{5}{19}q.$

B - - 11 16 10 $0\frac{8}{19}$

C - - 12 12 7 $2\frac{6}{19}$

4. X, Y, and Z made a joint stock for 12 months: X at first put in 20l. and 4 months after 20l. more; Y put in at first 30l. at the end of 3 months he put in 20l. more, and 2 months after he put in 40l. more; Z put in at first 60l. and 5 months after he put in 10l. more, 1 month after which he took out 30l. during the 12 months they gained 50l. how much of it must each have?

Ans. X must have 10l. 18s. 6d. $3\frac{49}{61}q.$

Y - - 22 8 1 $0\frac{12}{61}$

Z - - 16 13 4 0

BARTER.

BARTERING is the exchanging of commodities; and as neither party is supposed to sustain any loss, when the commodities exchanged are not of equal value, the defect is supplied with money, &c.

CASE I.

When the quantity of one commodity is given, with its value, or that of its integer; as also the value of the integer, or rate of selling some other commodity to be given for it, to find the quantity of this; or having the quantity of the latter given, to find the rate of selling it.

E

If

If the amount of the given quantity be unknown, calculate it in the shortest manner you can, from the given value of its integer; then find how much of the other quantity this amount will purchase, at the given rate of selling it; or if the quantity be given, from thence find the rate of selling it.

CASE II.

If the quantities of both commodities, with the rate of selling them, be given; to find what quantity of some other commodity or money must be given in case of an inequality of the amount of the first commodities.

Calculate the amount of each of the two given commodities; then their difference is the money, or amount of the third commodity to be advanced; whose quantity, from thence and its rate, is easily found.

CASE III.

When, in bartering, one commodity is rated above the ready-money price; to find the quantity and bartering price of the other commodity.

Say, As the ready-money price of the one is to its bartering price, so is that of the other to its barter price; then the quantity of the latter commodity may be found either from the ready-money or bartering prices.

Note. These are the most general cases in barter, and such questions as are not contained in them, are easily resolved from a little consideration of their nature.

EXAMPLES.

1. How much tobacco at 1l. 16s. per cwt. must be given for 3 pipes of wine at 28l. 10s. per pipe?

Ans. 47 c. 2 qr.

2. How much cloth at 14s. 6d. per yard, must be given for 3 cwt. 3 qr. of sugar, at 3l. 4s. per cwt.

Ans. 16 yds. $2\frac{6}{9}$ qr.

3. What weight of hops, at 1l. 12s. per cwt. must be given for 14 cwt. 1 qr. 18 lb. of cheese, at 1l. 6s. per cwt?

Ans. 11 c. 2 qr. $23\frac{3}{4}$ lb.

4. If 24 yards of cloth be given for 5 cwt. 1 qr. of tobacco, at 1l. 18s. per. cwt. what is the cloth rated at per yard?

Ans. 8s. $3\frac{3}{4}$ d.

5. A and B would barter: A hath 40 yards of cloth at 7s. and 4d. per yard, B hath $28\frac{1}{2}$ lb. of tea, at 11s. 6d. per lb.

1b. whether must pay balance, and how much?

Ans. A must pay 1l. 14s. 5d.

6. C and D would barter: C has 53 quarters 5 bushels of corn, at 1l. 10s. per quarter; for which D would give 13 cwt. 16 lb. of sugar, at 4l. 12s. per cwt. and the balance in raisins, at $6\frac{1}{2}$ per lb. how many lb. of raisins must be given? - - - - -

Ans. $73\frac{67}{91}$ lb.

7. E and F barter: E gives to F 90 gallons of brandy, at 7s. 8d. per gallon; for which F gives to E 10 guineas in money, and 500 lb. of cotton; what is it valued at per lb.

Ans. 11d. $2\frac{2}{3}$ q.

8. G and H bartered: G had 13 cwt. 5 lb. of sugar, worth 1l. 15s. per cwt. but bartered it with H at 2l. 4s. per cwt. for wine worth 4s. 8d. per gallon: what was the barter price of the wine, and how much of it was given for the sugar?

Ans. 5s. $10\frac{2}{3}$ d. per gal. and $97\frac{187}{224}$ gal. equal the sugar.

9. K and L. barter: K has woollen cloth worth 8s. per yard, which he barterers at 9s. 3d. with L, for linen cloth, at 3s. per yard, which is worth only 2s. 7d. per yard: whether has the advantage in barter, and how much linen does L give K for 70 yards of woollen? - Ans. $215\frac{5}{8}$ yds. of linen; and L has the advantage, his proportional barter price being only 2s. 11d. $3\frac{3}{4}$ q.

LOSS AND GAIN.

QUESTIONS in this rule are such whose solutions determine the *loss* or *gain* upon commodities; of which questions there is a great variety; but they may be all easily solved from a little consideration and the following proportion, *viz.* That the *gains* or *losses* are in proportion as the *quantities* of goods, &c.

EXAMPLES.

1. Bought 5 c. 3 qr. 14 lb. of cheese, at 1l. 12s. per cwt. and sold it again for 2l. 0s. 8d. per cwt. what was the gain upon the whole? - - - - -

Ans. 2l. 10s. 11d.

2. If 5 c. 3 qr. 14 lb. be bought for 9l. 8s. and sold for 11l. 18s. 11d. what is the rate of gain per cwt?

Ans. 8s. 8d.

3. If 8 c. 18 lb. be bought for 45l. at what rate per lb. shall I sell it to gain 10l. upon the whole?

Ans. 1s. 2d. $1\frac{35}{457}q$.

4. If 8 c. 18 lb. cost 45l. at what rate per lb. must it be sold, that the loss upon the whole may be 10l?

Ans. $9\frac{87}{457}d$.

5. Bought hops at 4l. 16s. per cwt. at what rate per cwt. must I sell them to gain 15l. per cent?

Ans. 5l. 10s. 4d $3\frac{1}{5}q$.

6. Bought hops at 4l. 16s. per cwt. at what rate per cwt. must I sell them, to lose 15l. per cent?

Ans. 4l. 1s. $7\frac{1}{5}d$.

7 * If, when I sell cloth at 7s. per yard, I gain 10l. per cent. what will be the gain per cent. when it is sold for 8s. 6d. per yard? - - - - -

Ans. 33l. 11s. $5\frac{1}{7}d$.

8. If, when I sell cloth at 7s. a yard, I gain 10l. per cent. what is the gain or loss per cent. when it is sold at 6s. a yard? - - - - -

Ans. 5l. 14s. $3\frac{3}{7}d$. loss.

9. If, when I sell sugar at 8s. 6d. a stone, I lose 5l. per cent. what do I gain or lose per cent. when I sell it for 9s. a stone? - - - - -

Ans. 11s. $9\frac{3}{7}d$. gain.

10. Bought for 17s. 8d. and sold for 18s. 4d. what was the gain per cent? - - - - -

Ans. 3l. 15s. 5d. $2\frac{3}{4}q$.

11. Bought 12 yds. of cloth for 5l. 9s. and sold them again at 9s. 6d. a yard: what was the gain or loss per cent?

Ans. 4l. 11s. 8d. $3\frac{7}{109}q$. gain.

12. At $1\frac{1}{2}d$. per shilling profit, how much per cent?

Ans. 12l. 10s.

13. At 3s. 6d. to the pound profit, how much per cent?

Ans. 17l. 10s.

14. Having

* Questions of this sort are seldom rightly understood, or solved. Thus, the question beginning at the 7th line of page 33 of the 4th edition of Webster's arithmetic is wrong, the true answer being 33l. and not 10l. And in the same manner has Stonehouse falsely solved the second example in page 89 of the 3d edition of his arithmetic, the answer to which question should be 23l. 12s. 6d. and not 8l. 12s. 6d. Also in a manner similar to these has Dilworth falsely calculated his 7th example in loss and gain, making the answer 2l. 16s. 3d. instead of 3l. 1s. $9\frac{3}{7}d$. though this question has Lowe copied into his book of arithmetic with the false answer; as he has done several others from different authors, whereof one is from Malcolm, who brought out his answer wrong, not by a false method of solution, but by some wrong figures slipping from his pen in the process, or in the proposition. Hill has also run into the same mistake.—The error consists in making the gain or loss of 100l. the 3d term of the stating, instead of the amount of 100l. For the stating should be thus,

8 7s : 8s 6d. :: 110l. : 133l. 11s. $5\frac{1}{7}d$. from which taking away the 100l. there remains the answer.

14. Having sold 12 yards of cloth for 5l. 14s. and thereby gained 8l. per cent. what was the prime cost of a yard?

Ans. 8s. 9d. $2\frac{2}{3}q.$

E X C H A N G E.

BY exchange is meant the bartering or exchanging of the money of one place for that of another; and, like the bartering of wares, it commonly consists in finding what quantity of the money of one place will be equal to a given sum of another, according to a given course of exchange.

By *course* of exchange is meant the variable sum of the money of one place which is proposed to be given for a constant piece or sum of that of another, to serve for the present, as a rate or proportion by which to exchange other sums, and is sometimes above and sometimes below the *par*.

By the *par* of exchange is meant an intrinsic equality between two pieces or sums of money, one of which is the constant piece or sum to which the course is compared.

The money in the banks of foreign places is finer or purer than that which is current in them; and the difference between any sum as valued in the one and its value in the other, is called *agio*.

Note. It is by comparing the bank money with ours that the *par* is ascertained. Also the exchange is always supposed to be made in bank money; and if there be a necessity for taking currency in case of a defect of the bank to answer the bills, the more of it must be received, and that in proportion to the *agio*.

I. *With IRELAND, AMERICA, and the WEST-INDIES.*

Accounts are kept in Ireland, America, and the West-Indies in pounds, shillings, and pence, as in England; and exchange *per cent.* sterling; the *par* being 108l. 6s. 8d. Irish per 100l. sterling, or 11. 1s. 8d. per pound: also 5l. sterling is accounted worth 7l. of the currency of the West-Indies, because of the great plenty of foreign coins there.

E X A M P L E S.

1. London remits to Dublin 375l. 15s. what must be received there, exchange at 110 per cent? - Ans. 413l. 6s. 6d.

E 3

2. Dublin

2. Dublin remits to London 413l. 6s. 6d. what must be received there, exchange at 110 per cent?

Ans. 375l. 15s.

3. London remits to Jamaica for 212l. 12s. 6d. sterling: what must be received for it, exchange at 135 per cent?

Ans. 287l. 10½d.

4. Jamaica remits to London for 287l. 10½d. currency: what must be received for it, exchange at 135 per cent?

Ans. 212l. 12s. 6d.

II. With HOLLAND, FLANDERS, and GERMANY.

In these places accounts are kept sometimes in pounds, shillings, and pence, as in England; and sometimes in guilders, stivers, and pennings; the money of Holland and Flanders is distinguished by the name *flemish*, and they exchange by the l. sterling, the par being 33s. 4d. flemish per pound sterling.

Note,
16 pennings—1 stiver.
20 stivers or 40 pence—1 guilder or florin.
And in Germany
12 phennings—1 shilling lub
16 lubish shilling—1 mark

8 pennings—1 grote or penny.
12 grotes or pence—1 skilling.
20 skillings—1 pound.
6 phennings—1 grote flem.
6 lubish shill.—1 skill. flem.
7½ marks lub.—1 pound flem.

E X A M P L E S.

1. To how much flemish will 700l. sterling amount, exchange at 34s. flem. per l. ster? - - - - - Ans. 1190l.

2. To how much sterling will 1190l. flemish amount, exchange at 34s. per l. ster? - - - - - Ans. 700l.

3. How much flemish must be given for 314l. 5s. sterling, exchange at 33s. 8d. flem. per l. ster? Ans. 528l. 19s. 9d.

4. How much sterling must be given for 528l. 19s. 9d. flem. exchange at 33s. 8d. per l. ster? - - - - - Ans. 314l. 5s.

5. How many guilders may I have for 173l. 14s. 2d. ster. exchange at 35s. 3½d. per l. ster?

Ans. 1839 gu. 2 st. 11½ pen.

6. How much sterling must I have for 2714 guil. 15 st. exchange at 35s. 6d. flem. per l. ster?

Ans. 254l. 18s. 1d. 16¼q.

7. What quantity of flemish currency must I have for 290l. 11s. 10d. ster. exchange at 33s. 10d. flem. per lb. ster. and agio at 4½ per cent? - - - - - Ans. 513l. 14s. 1d. 1¾q.

8. How

8. How much sterling must I receive for 805*l.* 15*s.* Flem. currency, the *agio* being 4 per cent. and exchange 34*s.* 6*d.* Flem. per *l.* ster? - - - - - Ans. 449*l.* 2*s.* 8*d.* 2 $\frac{17}{100}$ *q.*

9. To how much sterling will 7310 marks, 8 *sh.* 9 *ph.* amount, exchange at 36*s.* 4*d.* Flem. per *l.* ster? - - - - - Ans. 536*l.* 11*s.* 3 $\frac{81}{100}$ *d.*

10. How many marks must be received for 536*l.* ster. exchange at 36*s.* 4*d.* Flem. per *l.* ster.? - - - - - Ans. 7303 marks.

III. *With FRANCE.*

At France accounts are kept in *livres*, *sols*, and *deniers*, exchange being made by the French crown, whose *par* is 2*s.* 6*d.* sterling, or 2*s.* 5 $\frac{1}{4}$ *d.* more nearly.

Note, 12 deniers—a sol or sou, value	0	0 $\frac{1}{2}$ <i>d.</i>
20 sols—a livre	0	9 $\frac{1}{4}$ <i>d.</i>
3 livres—a crown or ecu	2	5 $\frac{1}{4}$ <i>d.</i>

EXAMPLES.

1. How many *livres* &c. will 121*l.* 18*s.* 6*d.* amount to, exchange at 32 $\frac{1}{2}$ *d.* per *ecu*? - - - - - Ans. 2670*li.* 5 *sol.* 11*d.*

2. To how much sterling will 3956 *livres* amount, exchange at 31*d.* per *ecu*? - - - - - Ans. 170*l.* 6*s.* 6 $\frac{3}{4}$ *d.*

3. How many French crowns may I have for 102*l.* 13*s.* 11 $\frac{1}{2}$ sterling, exchange at 31 $\frac{3}{8}$ *d.* per crown? - - - - - Ans. 785 *c.* 34 *sols.*

4. To how much ster. will 1978 *cr.* 25 *sols* amount, exchange at 31 $\frac{3}{8}$ per crown? - - - - - Ans. 260*l.* 13*s.* 11 $\frac{3}{8}$ *d.*

IV. *With SPAIN, &c.*

In Spain they keep their accounts in *piastres*, *rials*, and *mervadies*; reckoning 372 *mervadies* to a *rial*, and 8 *rials* to a *piastre*, by which they exchange, and whose *par* is 4*s.* 6*d.* sterling.

Note. In Genoa and Leghorn they keep their accounts in *livres*, *sols*, and *deniers*, as in France, but exchange by the *piastre*, as in Spain, which in Genoa is accounted 5 *livres*, and at Leghorn 6. At Venice too, accounts are by some kept in the same manner, and by others in *ducats* and *grofs*, reckoning 24 *grofs* to a *ducat*, upon which they exchange, and whose *par* is accounted 4*s.* 4*d.* sterling.

EXAMPLES.

1. How many *piastres*, &c. shall I receive in Spain for 510*l.* sterling, exchange at 50*d.* ster. at per. *piastre*? - - - - - Ans. 2448 *piastres.*

2. Spain draws upon London for 2448 piaftres, exchange at 50d. per piaftre; how much fterling will the draught amount to? - - - - - Anf. 510l.

3. How many livres, &c. muft be given at Genoa for 175l. 15s. fterling, exchange at 52d. fter. per piaftre?

Anf. 4055 liv. 15 fol, $4\frac{8}{13}$ dens.

4. Genoa draws upon London for 3000 livres: how much fterling will fatisfy this draught, exchange at $50\frac{1}{2}$ d. per piaftre? - - - - - Anf. 126l. 5s.

5. How many livres, &c. muft be received at Leghorn for 705l. 16s. 4d. fter. exchange at $51\frac{1}{2}$ d. fter. per piaftre?

Anf. 19735 liv. 9 fol. $1\frac{33}{63}$ den.

6. Leghorn draws upon London for 12000 liv. 14 fol. exchange at 50d. fterling per piaftre: how much muft be paid at London for this draught? Anf. 416l. 13s. 9d. $3\frac{1}{3}$ q.

7. How many ducats at Venice will a draught of 427l. fterling amount to, exchange at 49d. fter. per ducat?

Anf. 2091 duc. $10\frac{2}{7}$ gro.

8. Venice draws upon London for 2091 duc. 10 gro. exchange at 49d. fter. per ducat: to how much fter. does it amount? - - - - - Anf. 426l. 19s. 11d. $1\frac{2}{3}$ q.

V. With PORTUGAL.

In Portugal accounts are kept in milreas and reas, reckoning 1000 reas to a milrea, as its name imports; and they exchange by the milrea, whose par is about 6s. $8\frac{1}{2}$ d. or 6s. 9d. fterling.

E X A M P L E S.

1. To how many milreas will 715l. amount, exchange at 5s. 8d. per milrea? - - - Anf. 2523 mil. $529\frac{7}{7}$ reas.

2. To how many l. &c. will a draught of 2523 mil. 528 reas amount, exchange at 5s. 8d. per milrea?

Anf. 714l. 19s. 11d. $3\frac{111}{125}$ q.

3. How many milreas muft be given for 213l. 7s. 10d. exchange at 5s. $9\frac{1}{2}$ d. per milrea?

Anf. 736 milr. $892\frac{12}{135}$ reas.

4. To how much fterling will 736 milreas amount, exchange at 5s. $9\frac{1}{2}$ d. per milrea? - - Anf. 213l. 2s. 8d.

ARBITRATION OF EXCHANGES.

AS the course or rate of exchange between one nation and another is almost continually varying, either by rising or falling, from the variations in the circumstances and balance of trade; so the design of arbitration is to remit or draw upon foreign places in such a manner as shall turn out the most profitable.

Arbitration is generally divided into two parts, simple and compound.

I. SIMPLE ARBITRATION.

In simple arbitration the exchanges among three places only are concerned. The *par of arbitration*, or *arbitrated price*, is such a rate of exchange between two places as shall be in proportion with the rates assigned between each of them and a third place. After this par of arbitration is computed, by comparing it with the present course of exchange, a person can judge which way to remit or draw to the most advantage, and determine what the advantage shall be.

EXAMPLES.

1. If the exchange between London and Amsterdam be 33s. 9d. per l. sterling, and the exchange between London and Paris be 32d. per crown; required the par of arbitration between Amsterdam and Paris.

Ans. 54d. flem. per crown.

2. If the exchange between Amsterdam and Paris be 54d. per crown, and between Amsterdam and London 33s. 9d. per l. sterling; required the arbitrated price between Paris and London.

Ans. 32d. per crown.

3. If the exchange from London to Paris be 32d. per crown, and to Amsterdam 40s. per l. sterling; and if, by advice from Holland or France, the course of exchange between Amsterdam and Paris be fallen to 52d. per crown; what may be gained per cent. by London drawing on the one place and remitting to the other?

Ans. by drawing on Paris and remitting to Amsterdam may be gained 3l. 16s. 11 $\frac{1}{3}$ d. per cent.

4. London is indebted to Peterburgh 5000 rubles: now the exchange between Peterburgh and England is at

E 5

50d.

50d. per ruble, between Petersburg and Holland at 90d. per ruble, and between Holland and England at 36s. 4d. Which will be the more advantageous method for London to be drawn upon? - - Ans. London may gain 9l. 11s. $1\frac{1}{2}$ d. by making payment by way of Holland.

5. London was ordered to remit 500 ducats to Venice, at 50d. per ducat, and to draw upon Spain for the value, at 40d. per piastre; but when the order came to hand, bills on Venice were at $52\frac{1}{2}$ d. Now if London can draw upon Spain at $42\frac{1}{2}$ d. whether will it gain or lose, and how much?

Ans. $7\frac{6}{17}$ piales loss.

6. London was ordered to remit 800 crowns to Paris, at $31\frac{3}{8}$ d. per crown, and to draw upon Amsterdam for the value, at 36s. 9d. per l. but when the order came up, bills on Paris were at $31\frac{3}{8}$ d. What must be the rate of exchange with Amsterdam to compensate the advance on the remittance? - - - - - Ans. 36s. $5\frac{13}{33}$ d.

7. A merchant in London had 6000 guilders in the bank at Amsterdam, and was offered 22d. sterling a piece for them; but not liking the offer, he endorses a bill for the whole to his factor at Paris; who soon brought the money to France, by exchanging at 55d. Flemish per crown; he allows the factor $\frac{1}{2}$ per cent. commission for his trouble, and then draws upon him for the whole exchange at 32d. per crown. How much was this better than the offer of 22d. per guilder? - - - - - Ans. 28l. 18s. $2\frac{2}{11}$ d.

II. COMPOUND ARBITRATION.

Compound arbitration respects the cases in which the exchanges between three, four, or more places are concerned.

A person who knows at what rate he can draw or remit directly, and also hath advice of the course of exchange in foreign places, may trace out a path for circulating his money, through more or fewer of such places, and also in such order, as to make a benefit of his skill and credit: and herein lies the great art of such negotiations.

But to determine in what order, and through how many places to circulate a bill, no general rule can be given, it depending entirely upon a person's judgement and a close attention to the results of former cases of the like kind.

The

The directions necessary for determining whether a direct or an assigned circular draft shall be preferable, are contained in the following

R U L E S.

1. Distinguish the given rates or prices in the circular course, into antecedents and consequents; and place the antecedents in one column, and consequents in another on the right, fronting one another by way of equation. And in this distribution into antecedents and consequents, each consequent must be of the same kind with the next antecedent, and the first antecedent of the same kind with the last consequent, which must be the sum whose value in exchange is required.

2. Multiply the antecedents continually for a divisor, and the consequents continually for a dividend, and the quotient of the products will be the value of the sum required by such exchange.

3. Then compute its value by the direct exchange, or by any other circular exchange, and by comparing the values together you will perceive the most advantageous method.

E X A M P L E S.

1. If London would remit 1000l. sterling to Spain, the direct exchange being 42½d. per piaſtre of 272 mervadies, it is required whether will be more profitable, the direct remittance, or by remitting first to Holland, at 35s. per l. thence to France, at 58d. per crown; thence to Venice, at 100 crowns per 60 ducats; and thence to Spain, at 360 mervadies per ducat.

Antecedents.		Consequents.
1l. sterling	=	35s. or 420d. Flemish.
58d. Flemish	=	1 crown
100 crowns	=	60 ducats
1 ducat	=	360 mervadies
272 mervadies	=	1 piaſtre
How many piaſtres	=	1000l. sterling

Then $\frac{420 \times 60 \times 360 \times 1000}{58 \times 100 \times 272} = \frac{210 \times 30 \times 45 \times 10}{29 \times 17}$
 $= \frac{2835000}{493} = 5750\frac{250}{493}$ piaftres = the value of 1000l. by
 the circular exchange.

But $42\frac{1}{2}d. : 1$ piaftre $:: 1000l. \text{ or } 240000d. : \frac{480000}{85}$
 $= \frac{96000}{17} = 5647\frac{1}{17}$ piaftres = the value by the direct
 exchange.

So that the circular exchange is the more advantageous,
 it producing $103\frac{13}{29}$ piaftres more than the other.

2. A banker in Amsterdam remits to London 400l. flemish, thus, viz. first to France at 56d. per crown; thence to Venice at 100 crowns per 60 ducats; thence to Hamburgh at 100d. flemish per ducat; thence to Lisbon at 50d. per crusade of 400 reas; and lastly from Lisbon to London at 64d. sterling per milrea. How much sterling money will the remittance amount to; and how much will be gained or saved, supposing the direct exchange from Holland to London at 36s. 10d. per l. sterling?

Ans. 2l. 4s. $8\frac{248}{1547}d.$ gained.

3. A merchant at London has credit for 680 piaftres at Leghorn, for which he can draw directly at 50d. per piaftre; but chusing to try the circular way, they are by his order remitted, first to Venice at 94 piaftres per 100 ducats; thence to Cadiz at 320 mervadies per ducat; thence to Lisbon at 630 reas per piaftre of 272 mervadies; to Amsterdam at 50d. per crusade of 400 reas; thence to Paris at 56d. per crown; and thence to London at $31\frac{1}{3}d.$ per crown: How much is the circular remittance better than the direct draft, reckoning $\frac{1}{2}$ per cent. for commission?

Ans. 10l. 14s. $3\frac{53}{64}d.$ nearly.

Note, The allowance for commission is made by deducting $\frac{1}{2}$ per cent. from each of the consequents 100, 320, 630, 50, and 1 in the stating; the best way of doing which, is to deduct the 200th part of each from itself, or to diminish each in the ratio of 200 to 199.

ALLIGATION.

ALLIGATION is the method of mixing together several simples of different qualities, so that the composition may be of a middle quality: and it is commonly distinguished into two principal cases, denominated alligation medial and alligation alternate.

CASE I. ALLIGATION MEDIAL.

Alligation medial is the method of finding the rate of the compound from having the rates and quantities of the several simples given.

Note. That by the rates are meant the numbers which determine or define the proportions of the quantities of the simples and the compound; such as the given prices of their Integers or numbers expressing their degrees of fineness, or any other numbers proportional to them. And if any one of the simples be of little or no value with respect to the rest, its rate is supposed to be 0; as water mixed with wine, or alloy with gold and silver.

R U L E.

Multiply each quantity by its rate; then divide the sum of the products, by the sum of the quantities, or the whole composition; and the quotient will be the rate of the compound required.

E X A M P L E S.

1. A composition being made of 5 lb. of tea at 7s. per lb. 9 lb. at 8s. 6d. per lb. and $14\frac{1}{2}$ lb. at 5s. 10d. per lb. what is a lb. of it worth? - - - Ans. 6s. 10d. $2\frac{1}{4}q$.

2. what is a gallon of a composition of wine worth, which is made by mixing 4 gallons at 4s. 10d. per gallon, with 7 gallons at 5s. 3d. and $9\frac{3}{4}$ gallons at 5s. 8d. per gallon? - - -

Ans. 5s. 4d. $1\frac{4}{5}q$.

3. Having mixed together 17 gallons of ale at 9d. per gallon, 14 at $7\frac{1}{2}d$. 5 at $9\frac{1}{2}d$. and 21 at $4\frac{1}{2}d$. how much per gallon is the mixture worth? - - - - - Ans. $7\frac{1}{3}d$.

4. A mixture being made of 12 bushels of oats at 1s. 4d. per bush. 9 bushels of peas at 1s. 7d. and 4 bushels 2 pecks of beans at 1s. 2d. per bush. what will it be worth per bushel? - - - - - Ans. 1s. 4d. $2\frac{1}{4}q$.

5. A

5. A composition being made by mixing 8 gallons of wine, worth 5s. 9d. per gallon, with 7 gall. worth 5s. 11d. and 2 gall. of water: what is a gallon of it worth?

Anf. 5s. 1d. $2\frac{1}{7}q$.

6. having melted together 7 oz. of gold of 22 carats fine, $12\frac{1}{2}$ oz. of 21 carats fine, and 17 oz. of 19 carats fine: I would know the fineness of the composition?

Anf. $20\frac{1}{3}$ carats fine.

7. Of what fineness is that composition, which is made by mixing 3 lb. of silver of 9 oz. fine, with 5 lb. 8 oz. of 10 oz. fine, and 1 lb. 10 oz. of alloy? - Anf. $7\frac{6}{13}$ oz. fine.

CASE II. ALLIGATION ALTERNATE.

Alligation alternate, is the method of finding what quantity of each of the simples whose rates are given, will compose a mixture of a given rate; so that it is the reverse of alligation medial, and may therefore be proved by it.

R U L E.

1. Write the rates of the simples in a column under each other.
2. Connect, or link with a continued line, the rate of each simple which is less than that of the compound, with one or any number of those which are greater than the compound, and each greater rate with one or any number of the less.
3. Write the difference between the mixture rate and that of each of the simples opposite the rates with which these are linked.
4. Then if only one difference stand against any rate, it will be the quantity belonging to that rate; but if there be several, their sum will be the quantity.

Note. It appears from the rule, that many of the questions of this case will admit of various answers each; but from an algebraic process it appears that they will all have infinite varieties of answers; nay, if the expression may be allowed, that they will admit of infinite varieties of infinite varieties of answers. After one or more answers are found by the rule, as many more are found as you please by increasing or decreasing the quantities in any proportion, or by only increasing or decreasing any one or more single pairs of yoke fellows in any proportion, and leaving the other rates as they are; but as that answer is commonly desired which gives the rates in the least integer numbers, and those the nearest to each other, I have to each of the following questions put down such answers as I found by linking the rates together the most possible, and then, where no limitation was proposed, dividing the resulting quantities by their greatest common measure.

EXAMPLES.

EXAMPLES.

1. How much wine at 6s per gallon, and at 4s. per gallon must be mixed together, that the composition may be worth 5s. per gallon? - - Ans. 1 qrt. or 1 gal. or any one equal quantity of each sort.

2. How much sugar at 4d. at 6d. and at 11d. per pound, must be mixed together, that the composition may be worth 7d. per pound? - - Ans. 1 lb. or 1 stone, or 1 cwt. or any other equal quantity of each sort.

3. How much corn at 2s 6d. at 3s. 8d. at 4s. and at 4s. 8d. per bushel, must be mixed together, that the compound may be worth 3s. 10d. per bushel?

Ans. 2 at 2s. 6d. 2 at 3s. 8d. 3 at 4s. and 3 at 4s. 8d.

4. A composition whose rate may be 7s. 6d. being to be made by mixing together simples whose rates are 4s. 5s. 8d. 6s. 7s. 4d. and 8s. how much of each must be used? - - Ans. an equal quantity of the first four sorts, and 14 times the same quantity of the last sort.

5. To mix gold of 19 caracts fine, with gold of 23, of 21, of 18, and of 17 caracts fine, that the compound may be 20 caracts fine: what quantity must be taken of each?

Ans. 2 at $\begin{cases} 17 \\ 18 \\ 19 \end{cases}$ and 3 at $\begin{cases} 21 \\ 23 \end{cases}$

6. What are the proportions of the quantities of alloy, and gold of 22 caracts fine, which, when mixed together, will make the composition of 20 caracts fine? - - Ans. There must be 10 times as much gold as there is alloy.

Note. Sometimes one or more of the ingredients, and sometimes the whole composition is limited to a certain quantity; which I divide into the three following cases or limitations.

LIMITATION I.

When the whole composition is limited to a certain quantity, and that quantity is not found from the method of linking and taking the differences, then you may augment or diminish the quantity of each ingredient in the same proportion as the given quantity is greater or less than the total quantity found from the linking, by saying, As the total quantity so found, is to the given quantity, so is the quantity of each ingredient, found by linking, to the required quantity of each.

EXAMPLES.

EXAMPLES.

1. How much wine at 4s. at 5s. at 5s. 6d. and at 6s. a gallon, must be mixed together to form a composition of 18 gallons, worth 5s. 4d. a gallon?

Ans. 3 gal. at $\begin{cases} 4s. \\ 5s. \end{cases}$ and 6 gal. at $\begin{cases} 5s. \ 6d. \\ 6s. \end{cases}$

2. How much gold of 15, of 17, of 18, and of 22 caracts fine, must be mixed together, to form a composition of 40 ounces, of 20 caracts fine? - - Ans. 5 oz. of 15, of 17, and of 18, and 25 oz. of 22 caracts fine.

N. B. To this case belongs the question concerning king Hiero's crown, which the workmen had debased with silver, or copper; and to find what quantity of gold and copper was in it, the famous Archimedes is said to have made two other crowns of the same weight with the former, the one of gold, and the other of silver, or copper, and by putting each into a vessel full of water, the quantity of water expelled by them determined their specific bulks: from which, and their given weight, it is easier to determine the quantities of gold and copper in the crown by this case of alligation than by an algebraic process.

Suppose the weight of each crown to be 10 lb. and that the water expelled by the copper or silver was 92 lb. by the gold 52 lb. and by the compound crown was 64 lb. that is, their specific bulks were as 92, 52, and 64.

Here then the rates of the simples are 92 and 52, and of the compound 64; whence

64 $\left| \begin{matrix} 92 \\ 52 \end{matrix} \right. \begin{matrix} 12 \text{ of copper.} \\ 28 \text{ of gold.} \end{matrix} \left\{ \begin{matrix} \text{The sum of these is } 12 + 28 = 40, \text{ which should have been} \\ \text{but } 10, \text{ wherefore by our rule} \end{matrix} \right.$

As 40 : 10 :: $\begin{cases} 12 : 3 \text{ of copper,} \\ 28 : 7 \text{ of gold.} \end{cases}$

LIMITATION II.

When one of the ingredients is limited to a certain quantity, and that quantity is not found by the method of linking; you may either augment, or diminish the quantities of all the rest, in the same proportion as the given quantity is greater or less than the quantity of the limited simple found by linking, by stating as in the first limitation: * Or, you may only augment, or diminish, in

* Hence we may observe that Mr. Malcolm has inadvertently given a rule in page 569 of his arithmetic, for questions of this sort when the limited simple is only once linked, which will not always give true answers; he says, "If the simple whose quantity is limited, is only once linked we need do no more than raise or diminish the quantity of that one simple with which it is linked, and leave the rest as they are." Instead of which, if he had considered that the simple with which the limited one is linked, may also be linked with some or more of the rest, I apprehend he would have said, Raise or diminish that part of the simple with which the limited one is linked, which is the difference betwixt the mixture rate and the rate of the limited simple.

ALLIGATION.

113

in the above proportion, that part of the quantity of the ingredients with which the limited one is linked, which is the difference of the mixture rate and the rate of the limited simple, and add the resulting quantity to the other parts, instead of the said difference; keeping the quantities of the other simples unaltered.

EXAMPLES.

1. How much wine at 5s. at 5s. 6d. and at 6s. the gallon must be mixed with 3 gallons at 4s. the gallon, that the mixture may be worth 5s. 4d. a gallon?

Ans. $\left\{ \begin{array}{l} 3 \text{ gal. at } 5\text{s.} \\ 6 \text{ - - } 5\text{s. } 6\text{d.} \\ 6 \text{ - - } 6\text{s.} \end{array} \right\}$ by proportioning all the quantities:

Or, $\left\{ \begin{array}{l} 10 \text{ gal. at } 5\text{s.} \\ 8\frac{2}{3} \text{ - - } 5\text{s. } 6\text{d.} \\ 8\frac{2}{3} \text{ - - } 6\text{s.} \end{array} \right\}$ by proportioning only the difference of the mixture and limited rates.

2. How much gold of 15, of 17, and of 22 caracts fine, must be mixed with 5 ounces of 18 caracts fine, that the composition may be 20 caracts fine?

Ans. $\left\{ \begin{array}{l} 5 \text{ oz. of } 15 \text{ caracts fine} \\ 5 \text{ - - - } 17 \text{ - - - -} \\ 25 \text{ - - - } 22 \text{ - - - -} \end{array} \right\}$ by proportioning all the quantities.

Or, $\left\{ \begin{array}{l} 2 \text{ oz. of } 15 \text{ caracts fine} \\ 2 \text{ - - - } 17 \text{ - - - -} \\ 13 \text{ - - - } 22 \text{ - - - -} \end{array} \right\}$ by proportioning only the difference of the mixture and limited rates.

LIMITATION III.

If more than one of the simples be limited, find by Case I. what will be the rate of a mixture made of the given quantities of the limited simples only; then consider this as the rate of a limited simple, whose quantity is the sum of the first given limited simples, from which, and the rates of the limited simples, by the second limitation, calculate the quantity of each.

EXAMPLES.

EXAMPLES.

1. How much wine at 5s. 6d. and at 6s. a gallon, must be mixed with 3 gallons at 4s. and 3 gallons at 5s. a gallon, that the mixture may be worth 5s. 4d. a gallon?

Ans. 6 gal. at 5s. 6d. and 6 gal. at 6s. a gallon.

2. How much gold at 15 and 17 carats fine, must be mixed with 5 ounces of 18, and 13 ounces of 22 carats fine, that the composition may be of 20 carats fine?

Ans. 2 oz. of each sort.

INVOLUTION.

A POWER is a number produced by multiplying any given number continually into itself a certain number of times.

Any number is called the first power of itself; if it be multiplied by itself, the product is called the second power, and sometimes the square; if this be multiplied by the first power again, the product is called the third power, and sometimes the cube; and if this be multiplied by the first power again, the product is called the fourth power, &c. that is, the power is denominated from the number which exceeds the multiplications by 1.

Thus: 3 is the first power of 3.

$3 \times 3 = 9$ is the second power of 3:

$3 \times 3 \times 3 = 27$ is the third power of 3.

$3 \times 3 \times 3 \times 3 = 81$ is the fourth power of 3.

&c.

&c.

And in this manner may be calculated the following table.

TABLE

INVOLUTION.

115

TABLE of the first twelve powers of numbers.

1st power	2	3	4	5	6	7	8	9
2d power	4	9	16	25	36	49	64	81
3d power	8	27	64	125	216	343	512	729
4th power	16	81	256	625	1296	2401	4096	6561
5th power	32	243	1024	3125	7776	16807	32768	59049
6th power	64	729	4096	15625	46656	117649	262144	531441
7th power	128	2187	16384	78125	279936	823543	2097152	4782969
8th power	256	6561	65536	390625	1679616	5764801	16777216	43046721
9th power	512	19683	262144	1953125	10077696	40353607	134217728	387420489
10th power	1024	59049	1048576	9765625	60466176	282475249	1073741824	3486784401
11th power	2048	177147	4194304	48828125	362797056	1977326743	8589934592	31381059609
12th power	4096	531441	16777216	244140625	2176782336	13841287201	68719476736	282429536481

Note

Note 1. The number which exceeds the multiplications by 1, is called the index or exponent of the power: so the index of the first power is 1, that of the second power is 2, that of the third is 3, &c.

2. Powers are commonly denoted by writing their indices above the first power: so the second power of 3 may be denoted thus 3^2 , the third power thus 3^3 , the fourth power thus 3^4 , &c. and the 6th power of 503 thus 503^6 .

Involution is the finding of powers; to do which from their definition, there evidently comes this

R U L E.

Multiply the given number, or first power, continually by itself, till the number of multiplications be 1 less than the index of the power to be found, and the last product will be the power required.

Note 1. Whence because fractions are multiplied by taking the products of their numerators and of their denominators, they will be involved by raising each of their terms to the power required. And if a mixt number be proposed, either reduce it to an improper fraction, or reduce the vulgar fraction to a decimal, and proceed by the rule.

2. The raising of powers will be sometimes shortened by working according to this observation, viz. whatever two or more powers are multiplied together, their product is the power whose index is the sum of the indices of the factors; or if a power be multiplied by itself, the product will be the power whose index is double of that which is multiplied: so if I would find the sixth power, I might multiply the given number twice by itself for the third power, then the third power into itself would give the sixth power; or if I would find the seventh power; I might first find the third and fourth, and their product would be the seventh; or lastly, if I would find the eighth power; I might first find the second, then the second into itself would be the fourth, and this into itself would be the eighth.

E X A M P L E S.

1. What is the second power of 45? - - - Ans. 2025.
2. What is the square of 416? - - - Ans. 173056.
3. What is the square of .027? - - - Ans. .000729.
4. What is the third power of 3.5? - - - Ans. 42.875.
5. What is the fourth power of 71.8?
Ans. 26576499.4576.
6. What is the fifth power of .029?
Ans. .000000020511149.
7. What is the sixth power of 5.03?
Ans. 16196.005304479729.
8. What is the second power of $\frac{2}{3}$? - - - - Ans. $\frac{4}{9}$.
9. What is the third power of $\frac{5}{9}$? - - - - Ans. $\frac{125}{729}$.
10. What is the square of $3\frac{2}{3}$? - - - - Ans. $28\frac{8}{9}$ or 11.56.

EVOLUTION.

THE root of any given number, or power, is such a number, as being multiplied by itself a certain number of times, will produce the power; and it is denominated the first, second, third, fourth, &c. root, respectively, as the number of multiplications made of it to produce the given power is 0, 1, 2, 3, &c. that is, the name of the root is taken from the number which exceeds the multiplication by 1, like the name of the power in involution.

Note 1. The index of the root, like that of the power in involution, is 1 more than the number of the multiplications necessary to produce the power or given number.

2. Roots are sometimes denoted by writing $\sqrt{}$ before the power, with the index of the root against it: so the third root of 50 is $\sqrt[3]{50}$ and the second root of it is $\sqrt{50}$, the index 2 being omitted; which index is always understood when a root is named or written without one. But if the power be expressed by several numbers with the sign + or -, &c. between them, then a line is drawn from the top of the sign of the root, or radical sign, over all the parts of it; so the third root of $47 - 15$ is $\sqrt[3]{47 - 15}$. And sometimes roots are designed like powers, with the reciprocal of the index of the root above the given number. So the root of 3 is $3^{\frac{1}{2}}$, the root of 50 is $50^{\frac{1}{3}}$, and the third root of it is $50^{\frac{1}{9}}$, also the third root of $47 - 15$ is $(47 - 15)^{\frac{1}{3}}$. And this method of notation has justly prevailed in the "modern algebra;" because such roots, being considered as fractional powers, need no other directions for any operations to be made with them than those for integral powers.

3. A number is called a complete power of any kind when its root of the same kind can be accurately extracted; but if not, the number is called an imperfect power, and its root a surd or irrational quantity; so 4 is a complete power of the second kind, its root being 2; but an imperfect power of the third kind, its third root being a surd quantity.

Evolution is the finding of the roots of numbers, either accurately, or in decimals to any proposed degree of accuracy.

The power is first to be prepared for extraction, or evolution, by dividing it, from the place of units, to the left hand in integers, and to the right in decimal fractions, into periods, containing each so many places of figures as are denominated by the index of the root, if the power contain a complete number of such periods: if it do not, the defect will be either on the right hand, or left, or both; if the defect be on the right hand, it may be supplied

plied by annexing ciphers, and after this whole periods of ciphers may be annexed to continue the extraction with, if necessary; but if there be a defect on the left, such defective period must remain unaltered, and is accounted the first period of the given number, just the same as if it were complete.

Now this division may be conveniently made by writing a point over the place of units, and also over the last figure of every period on both sides of it; that is, over every second figure if it be the second root, over every third if it be the third root, &c. Thus to point this number

21035896·12735 for the second root, it will be 21035896·127350; but for the third root, thus 21035896·1273500; and for the fourth, thus 21035896·12735000.

Note. The root will contain just as many places of figures as there are periods or points in the given power; and they will be integers, or decimals respectively, as the periods are so from which they are found, or to which they correspond; that is, there will be as many integer or decimal figures in the root, as there are periods of integers or decimals in the given number.

TO EXTRACT THE SQUARE ROOT.

1. Having pointed the given number into periods of two figures each, find, from the table of powers in page 115, or otherwise, a square number either equal to, or the next less than the first period, which subtract from it, and place the root of the square on the right of the given number, after the manner of a quotient in division, for the first figure of the root required.

2. To the remainder annex the second period for a dividend; and on the left thereof write the double of the root already found, after the manner of a divisor.

3. Consider what figure, which, if annexed to the divisor, and the result multiplied by it, the product may be equal to, or the next less than the dividend, and it will be the next figure of the root.

4. From the dividend subtract the product, and to the remainder bring down the next period, for a new dividend: to which as before, find a divisor by doubling the figures already found in the root; and from these find the next

next figure of the root, as in the last article; and continue the operation still in the same manner till all the periods be used, or as far as you please.

Note 1. In the last place of the following answers, I write such figure as is nearest the truth, whether it be too great or too little; that is, if the next figure would equal or exceed 5, I increase the last place by 1, if not, I do not alter it.

2. When the root is to be extracted to a great number of places, the work may be much abbreviated thus: having proceeded in the extraction after the common method till you have found one more than half the required number of figures in the root, the rest may be found by dividing the last remainder by its corresponding divisor, annexing a cypher to every dividend, as in division of decimals; or rather, without annexing cyphers, by omitting continually the right-hand figure of the divisor, after the manner of the third contraction in division of decimals in page 80. So the operation for the root of 2 to 12 or 13 places, may be thus.

$$\begin{array}{r}
 2(1'41421356237 \div \text{root} \\
 \hline
 24 \overline{) 100} \\
 \underline{4 } 96 \\
 281 \overline{) 400} \\
 \underline{1 } 281 \\
 2824 \overline{) 11900} \\
 \underline{4 } 11296 \\
 28282 \overline{) 60400} \\
 \underline{2 } 56564 \\
 282841 \overline{) 383600} \\
 \underline{1 } 282841 \\
 2828423 \overline{) 10075900} \\
 \underline{3 } 8485269 \\
 2828426) 1590631 (56237 \div \\
 176418 \\
 6712 \\
 1055 \\
 206 \\
 8
 \end{array}$$

EXAMPLES.

1. What is the root of 2025? - - - - - Ans. 45.
2. What is the root of 17'3056? - - - - - Ans. 4'16.
3. What is the root of '000729? - - - - - Ans. '027.
4. What is the root of 3? - - - - - Ans. 1'73205.
5. What

5. What is the root of 5? - - - - - Ans. 2.236068.
 6. What is the root of 6? - - - - - Ans. 2.44949.
 7. What is the root of 7? - - - - - Ans. 2.645751.
 8. What is the root of 10? - - - - - Ans. 3.162278.
 9. What is the root of 11? - - - - - Ans. 3.316625.

RULES for the Square roots of VULGAR FRACTIONS and MIXT NUMBERS.

First prepare all vulgar fractions by reducing them to their least terms, both for this and all other roots. Then

1. Take the root of the numerator and of the denominator for the respective terms of the root required. And this is the best way if the denominator be a complete power. But if it be not,

2. Multiply the numerator and denominator together; take the root of the product; this root being made the numerator to the denominator of the given fraction, or made the denominator to the numerator of it, will form the fractional root required.

$$\text{That is, } \sqrt{\frac{a}{b}} = \frac{\sqrt{ab}}{b} = \frac{\sqrt{ab}}{b}.$$

And this rule will serve whether the root be finite or infinite.

3. Or reduce the vulgar fraction to a decimal, and extract its root.

4. Mixt numbers may be either reduced to improper fractions, and extracted by the first or second rule; or the vulgar fraction may be reduced to a decimal, then joined to the integer, and the root of the whole extracted.

EXAMPLES.

1. What is the root of $\frac{25}{36}$? - - - - - Ans. $\frac{5}{6}$.
 2. What is the root of $\frac{27}{147}$? - - - - - Ans. $\frac{3}{7}$.
 3. What is the root of $\frac{9}{12}$? - - - - - Ans. .866025.
 4. What is the root of $\frac{3}{12}$? - - - - - Ans. .645497.
 5. What is the root of $17\frac{3}{8}$? - - - - - Ans. 4.168333.

By means of the square root also we readily find the 4th root, or the 8th root, or the 16th root, &c. that is, the root of any power whose index is some power of the number 2; namely, by extracting so often the square root as is denoted by that power of 2; that is, two extractions for the fourth root, three for the 8th root, and so on.

$$\begin{array}{r}
 210358000 \text{ (} \\
 \begin{array}{r}
 \sqrt{210358000} \\
 24 \overline{) 110} \\
 \underline{96} \\
 285 \overline{) 1435} \\
 \underline{1425} \\
 29003 \overline{) 108000} \\
 \underline{6} \quad 87009 \\
 20991 \overline{) 7237} \\
 \underline{687} \\
 107 \\
 20
 \end{array}
 \end{array}
 \begin{array}{r}
 145037237 \text{ (} 120431407 \text{ root. } \\
 \begin{array}{r}
 \sqrt{145037237} \\
 22 \overline{) 45} \\
 \underline{44} \\
 2404 \overline{) 10372} \\
 \underline{9616} \\
 24083 \overline{) 75637} \\
 \underline{672249} \\
 3388 \text{ (} 1407 \\
 \underline{980} \\
 17
 \end{array}
 \end{array}$$

TO EXTRACT THE CUBE ROOT.

1. By trials take the nearest rational cube to the given cube or number, and call it the assumed cube.

2. Then the sum of the given number and double the assumed cube, will be to the sum of the assumed cube and double the given number, as the root of the assumed cube, is to the root required, nearly. Or as the first sum is to the difference of the given and assumed cube, so is the assumed root, to the difference of the roots nearly.

3. Again, by using, in like manner, the cube of the root last found as a new assumed cube, another root will be obtained still nearer. And so on as far as we please; using always the cube of the last-found root, for the assumed cube.

EXAMPLES.

F

EXAMPLE.

To find the Cube Root of 21034·8.

Here we soon find that the root lies between 20 and 30, and then between 27 and 28. Taking therefore 27, its cube is 19683 the assumed cube. Then

$$\begin{array}{r}
 19683 \quad 21035 \cdot 8 \\
 \underline{2} \quad \quad \underline{2} \\
 39366 \quad 42071 \cdot 6 \\
 \underline{21035 \cdot 8} \quad \underline{19683} \\
 \text{As } 60401 \cdot 8 : 61754 \cdot 6 :: 27 : 27 \cdot 6047
 \end{array}$$

$$\begin{array}{r}
 27 \\
 \hline
 4322822 \\
 1235092 \\
 \hline
 604018) 1667374 \cdot 2 (27 \cdot 6047 \text{ the root nearly.}
 \end{array}$$

$$\begin{array}{r}
 459338 \\
 36525 \\
 284 \\
 42
 \end{array}$$

Again for a second operation, the cube of this root is 21035·318645155823, and the process by the latter method will be thus

$$\begin{array}{r}
 21035 \cdot 318645 \text{ \&c.} \\
 \underline{2} \\
 42070 \cdot 637290 \quad 21035 \cdot 8 \\
 \underline{21035 \cdot 8} \quad 21035 \cdot 318645 \text{ \&c.} \\
 \text{As } 63106 \cdot 43729 : \text{dif. } 481355 :: 27 \cdot 6047 : \\
 \text{the dif. } 000210834 \\
 \text{conseq. the root req. is } 27 \cdot 604910834
 \end{array}$$

TO EXTRACT ANY ROOT WHATEVER.

Let G be the given power or number, n the index of the power, A the assumed power, r its root, R the required root of G

Then

Then as the sum of $n+1$ times A and $n-1$ times G , is to the sum of $n+1$ times G and $n-1$ times A , so is the assumed root r , to the required root R .

Or, as half the said sum of $n+1$ times A and $n-1$ times G , is to the difference between the given and assumed powers, so is the assumed root r , to the difference between the true and assumed roots: which difference added or subtracted, gives the true root nearly.

That is, $\overline{n+1. A + n-1. G} : \overline{n+1. G + n-1. A} :: r : R$,
Or, $\overline{n+1. \frac{1}{2}A + n-1. \frac{1}{2}G} : A \oslash G :: r : R \oslash r$.

And the operation may be repeated as often as we please, by using always the last found root for the assumed root, and its n th-power for the assumed power A .

EXAMPLE.

To extract the 5th root of 21035.8.

Here it appears that the 5th root is between 7.3 and 7.4. Taking 7.3, its 5th power is 20730.71593. Hence then we have

$$G = 21035.8; r = 7.3; n = 5; \frac{1}{2} \overline{n+1} = 3; \text{ and } \frac{1}{2} \overline{n-1} = 2.$$

$$A = 20730.716$$

$$G - A = 305.084$$

$$A = 20730.716 \quad G = 21035.8$$

$$\begin{array}{r} 3 \\ 3 A = 62192.148 \end{array}$$

$$\begin{array}{r} 2 \\ 2 G = 42071.6 \end{array}$$

$$\text{As } 104263.7 : 305.084 :: 7.3 : .0213605$$

$$\begin{array}{r} 73 \\ 915252 \\ 2135588 \\ \hline 104263.7 \overline{) 2227.1132} \quad (02 \ 3605 = -r \\ 14184 \quad 7.3 = r \text{ add} \\ 3758 \quad 7.321360 = R \text{ the} \\ 630 \quad \text{root true to the} \\ 5 \quad \text{last figure.} \end{array}$$

F 2

OTHER

OTHER EXAMPLES.

1. What is the 3d root of 2? - - - Ans. 1'259921.
2. What is the 4th root of 2? - - - Ans. 1'189207.
3. What is the 4th root of 97'41 - - - Ans. 3'1415999.
4. What is the 5th root of 2? - - - Ans. 1'148699.
5. What is the 6th root of 21035'8? - - - Ans. 5'254037.
6. What is the 6th root of 2? - - - Ans. 1'122462.
7. What is the 7th root of 21035'8? - - - Ans. 4'145392.
8. What is the 7th root of 2? - - - Ans. 1'104089.
9. What is the 8th root of 21035'8? - - - Ans. 3'470323.
10. What is the 8th root of 2? - - - Ans. 1'090508.
11. What is the 9th root of 21035'8? - - - Ans. 3'022239.
12. What is the 9th root of 2? - - - Ans. 1'080059.

GENERAL RULES *for extracting any root out of a Vulgar Fraction or Mixt Number.*

1. If the given fraction have a finite root of the kind required, it is best to extract the root out of the numerator and denominator, for the terms of the root required.
2. But if the fraction be not a complete power, it may be thrown into a decimal, and then extracted. Or,
3. Take either of the terms of the given fraction for the corresponding term of the root; and for the other term of the root, extract the required root of the product, arising from the multiplication of such a power of the first assigned term of the root whose index is less by 1 than that of the given power, by the other term of the given number. This rule will do when the root is either finite or infinite.

$$\text{That is, } \frac{a}{b} \Big|^\frac{1}{n} = \frac{a b^{n-1} \Big|^\frac{1}{n}}{b} = \frac{a}{b a^{n-1} \Big|^\frac{1}{n}}.$$

4. Mixt numbers may be reduced either to improper fractions or decimals, and then extracted.

EXAMPLES.

EXAMPLES.

1. What is the cube root of $\frac{8}{27}$? - - - - - Ans. $\frac{2}{3}$.
2. What is the fourth root of $\frac{80}{403}$? - - - - - Ans. $\frac{2}{3}$.
3. What is the cube root of $\frac{1}{2}$? - - - - - Ans. .7937005.
4. What is the cube root of $2\frac{10}{27}$? - - - - - Ans. $\frac{4}{3}$ or $1\frac{1}{3}$.
5. What is the third root of $7\frac{1}{3}$? - - - - - Ans. 1.930979.

OF PROPORTION IN GENERAL.

NUMBERS are compared together to discover the relations they have to each other.

There must be two numbers to form a comparison: the number which is compared, being written first, is called the antecedent; and that to which it is compared, the consequent.

Numbers are compared to each other two different ways: the one comparison considers the difference of the two numbers, and is called arithmetical relation, the difference being sometimes named the arithmetical ratio; and the other considers their quotient, which is termed geometrical relation, and the quotient the geometrical ratio. So of these numbers 6 and 3, the difference or arithmetical ratio, is $6 - 3 = 3$; and the geometrical ratio is $\frac{6}{3} = 2$.

Note. Ratios are here always considered as the result of the greater term of comparison diminished, or divided by the less, not regarding whether of them be the antecedent.

If two or more couplets of numbers have equal ratios, or differences, the equality is termed proportion; and their terms similarly posited, that is, either all the greater, or all the less taken as antecedents, and the rest as consequents, are called proportionals. So the two couplets 2, 4, and 6, 8, taken thus, 2, 4, 6, 8, or thus, 4, 2, 8, 6, are arithmetical proportionals; and the two couplets 2, 4, and 8, 16, taken thus, 2, 4, 8, 16, or thus, 4, 2, 16, 8, are geometrical proportionals.

To denote numbers as being geometrically proportional, the couplets are separated by a double colon, and

F 3

a colon

a colon is written between the terms of each couplet: we may also denote arithmetical proportionals by separating the couplets with a double colon, and writing a colon, turned horizontally between the terms of each couplet. So the above arithmetics may be written thus, $2 \dots 4 :: 6 \dots 8$, and $4 \dots 2 :: 8 \dots 6$; where the first antecedent is less or greater than its consequent, by just so much as the second antecedent is less or greater than its consequent: and the geometricals thus, $2 : 4 :: 8 : 16$, and $4 : 2 :: 16 : 8$; where the first antecedent is contained in or contains its consequent, just so often as the second is contained in or contains its consequent.

Note, it is common to read the geometricals $4 : 2 :: 16 : 8$, thus, 4 is to 2 as 16 to 8.

Proportion is distinguished into continual and discontinued.

If, of several couplets of proportionals written down in a series, the difference or ratio of each consequent and the antecedent of the next following couplet be the same as the common difference or ratio of the couplets, the proportion is said to be continual, and the numbers themselves a series of continual proportionals, or an arithmetical or geometrical progression. So 2, 4, 6, 8. form an arithmetical progression; for $4 - 2 = 6 - 4 = 8 - 6 = 2$; and 2, 4, 8, 16 a geometrical progression; for $\frac{4}{2} = \frac{8}{4} = \frac{16}{8} = 2$.

But if the difference or ratio of the consequent of one couplet and the antecedent of the next couplet, be not the same as the common difference or ratio of the couplets, the proportion is said to be discontinued. So 4, 2, 8, 6 are in discontinued arithmetical proportion; for $4 - 2 = 8 - 6 = 2$, and $8 - 2 = 6$: also 4, 2, 16, 8 are in discontinued geometrical proportion; for $\frac{4}{2} = \frac{16}{8} = 2$, and $\frac{16}{2} = 8$.

If the succeeding terms of a progression exceed each other, it is called an ascending progression or series; if the contrary a descending series.

So $\begin{cases} 0, 1, 2, 3, 4, \&c. \text{ is an ascending arithmetical series.} \\ 1, 2, 4, 8, 16, \&c. \text{ is an ascending geometrical series.} \end{cases}$
and $\begin{cases} 4, 3, 2, 1, 0, \&c. \text{ is a descending arithmetical series.} \\ 16, 8, 4, 2, 1, \&c. \text{ is a descending geometrical series.} \end{cases}$

Note, The first and last terms of a progression are called the extremes; and the other terms, the means.

ARITH-

ARITHMETICAL PROGRESSION.

AN arithmetical progression is a series whereof the succeeding terms are either all greater or less than their adjacent preceding terms by the same number or difference.

Note. The fundamental property of an arithmetical progression, from which almost all its other properties are deducible, and which evidently follows from its construction, is, that the sum of any two of its terms is equal to the sum of any other two terms taken at an equal distance, but on contrary sides of the former; or that the double of any one term is equal to the sum of any two terms taken at an equal distance from it on each side. And of any two couplets in discontinued arithmetical proportion, the two sums are equal which are made by adding the antecedent of each to the consequent of the other.

PROBLEM I.

Give one of the extremes, the common difference, and the number of terms of an arithmetical series; to find

1. The other extreme.

RULE.

To or from the given term, according as it is the least or greatest, add or subtract the product of the common difference multiplied by 1 less than the number of terms, and the sum or difference will be the term required.

2. The sum of all the terms of the series.

RULE.

Multiply the sum of the extremes by the number of terms, and half the product will be the sum of the series.

Thus, if a represent the less extreme,

z the greater,

d the common difference,

n the number of terms, and

s the sum of the series;

$$\text{then } \begin{cases} z = a + d \times n - 1. \\ a = z - d \times n - 1. \end{cases}$$

$$\text{and } \begin{cases} s = \frac{2a + dn - d}{2} \times n \\ s = \frac{2z - dn + d}{2} \times n. \end{cases}$$

F 4

EXAMPLES.

EXAMPLES.

1. Given the least term 3, the common difference 2, and the number of terms 9 : to find the greatest term and the sum of the series? - - Ans. The greatest term is 19, and the sum of the series is 99.

2. If the greatest term be 70, the common difference 3, and the number of terms 21 ; what is the least term, and the sum of the series? - - Ans. The least term is 10, and the sum is 840.

3. A debt can be discharged in a year, by paying 1 shilling the first week, 3 shillings the second, and so on, always 2 shillings more every week ; what is the debt, and what will the last payment be? - - Ans. The last payment will be 5l. 3s. and the debt is 135l. 4s.

4. One hundred stones being disposed on the ground in a straight line, at the distance of a yard from each other ; how many yards will a person travel who shall bring them all, one by one to a basket, placed one yard from the first stone ?

Ans. 10100 yds, or 5 mls. 1300 yds, or $5\frac{1}{4}$ mls. wanting 20 yds.

PROBLEM II.

Given the extremes and the common difference, to find

1. The number of terms.

RULE.

Divide the difference of the extremes by the common difference, add 1 to the quotient, and the sum will be the number of terms.

2. The sum of the series.

Having found the number of terms, the sum of the series will be had by the second case of problem 1.

Thus, using the same symbols as before, $n = \frac{z-a}{d} + 1$,

and $s = a + z \times \frac{z-a+d}{2d}$.

EXAMPLES.

1. If the extremes be 3 and 19, and the common difference 2 ; what is the number of terms, and the sum of the series?

Ans. The number of terms is 9, and the sum is 99.

2. If

2. If the extremes be 10 and 70, and the common difference 3; what is the number of terms, and the sum of the series?

Ans. The number of the terms 21, and the sum is 840.

3. What debt can be discharged, and in what time, supposing the first week the payment be 1s. and the payments every week following to increase by 2s. till the last payment be 5l. 3s? - - - Ans. The debt is 135l. 4s. and it will be discharged in a year or 52 weeks.

PROBLEM III.

Given the extremes and the number of terms, to find

1. The common difference.

R U L E.

This is found by dividing the difference of the extremes by 1 less than the number of terms.

2. The sum of the series.

This is had from the 2d case of problem 1.

Thus, $d = \frac{x-a}{n-1}$, and $s = \frac{a+x}{2} \times n$.

EXAMPLES.

1. If the extremes be 3 and 19, and the number of terms 9; what is the common difference and sum of the series?

Ans. The difference is 2, and the sum is 99.

2. If the extremes be 10 and 70, and the number of terms 21; what is the common difference and the sum of the series? - Ans. The difference is 3, and the sum is 840.

3. What debt can be discharged in a year, by weekly payments in arithmetical progression, whereof the first term or payment is 1s. and the last 5l. 3s. and what is the common difference of the series of payments?

Ans. The difference is 2s. and the debt is 135l. 4s.

GEOMETRICAL PROGRESSION.

A Geometrical Progression is a series of Numbers, of which the succeeding terms are either all greater or less than their adjacent preceding terms, in such sort that the ratio or quotient of every two adjacent terms is the same.

Note. The same thing is true with respect to the products of the terms of a geometrical proportion as we observed of the sums of the terms of an arithmetical proportion in the note in page 127. And the same analogy holds good in most of their problems; so that many of their rules are almost verbally the same, and differ only in this, that instead of the operations of addition, subtraction, multiplication, and division in arithmetical progression, are required respectively those of multiplication, division, involution, and evolution, in geometrical progression.

PROBLEM I.

Given one of the extremes, the ratio, and the number of the terms of a geometrical series; to find

1. The other extreme.

RULE.

Multiply or divide the given extreme by such power of the ratio whose index is one less than the number of terms, and the product or quotient will be the required term, according as it is the greater or less extreme.

2. The sum of the series.

RULE.

Divide the difference of the extremes, by the ratio less 1, to the quotient add the greater extreme, and it will give the sum of the series. Or, multiply the greatest term by the ratio, from the product subtract the least term, then divide the difference by the ratio less 1, and the quotient will be the sum of the series.

Thus, if a represent the least term,

z the greatest,

r the ratio,

n the number of the terms, and

s the sum of the series;

$$\text{then } \begin{cases} z = ar^{n-1}, \\ a = z \div r^{n-1}. \end{cases} \quad \text{and } \begin{cases} s = \frac{r^n - 1}{r - 1} \times a \\ s = \frac{r^n - 1}{r - 1} \times \frac{z}{r^{n-1}} \end{cases}$$

EXAMPLES.

EXAMPLES.

1. Given the least term 1, the ratio 2, and the number of terms 10; what is the greatest term, and the sum of the series?

Ans. The greatest term is 512, and the sum is 1023.

2. If the greatest term be 885735, the ratio 3, and the number of terms 12; what is the least term, and the sum of the series?

Ans. The least term is 5, and the sum 1328600.

3. What debt will be discharged in a year or 12 months, by paying 1l. the first month, 2l. the second, 4l. the third, and so on, each succeeding payment being double the last; and what will the last payment be?

Ans. The debt is 4095l. and the last payment 2048l.

PROBLEM II.

Given the extremes, and the ratio, to find

1. The sum of the series.

This is found by the second case of the last problem.

2. The number of terms.

RULE.

Divide the greatest term by the least; find what power of the ratio is equal to the quotient; then add 1 to the index of that power, and the sum will be the number of terms. Or, divide the difference of the logarithms of the extremes by the logarithm of the ratio, add 1 to the quotient, and the sum will be the number of terms.

Thus, $s = \frac{z-a}{r-1} + z = \frac{rz-a}{r-1}$, and

$$n = \frac{\log. z - \log. a}{\log. r} + 1 = \frac{\log. z - \log. a + \log. r}{\log. r}$$

EXAMPLES.

1. If the extremes be 1 and 512, and the ratio 2, what is the sum of the series, and the number of terms?

Ans. The sum is 1023, and the number of terms 10.

2. If the extremes be 5 and 885735, and the ratio 3; what is the sum of the series, and the number of terms?

Ans. The sum is 1328600, and the number of terms 12.

3. What debt will be discharged by monthly payments in geometrical progression, whereof the first is 11. and the last 20481. the ratio being 2; and in what time will it be discharged?

Ans. The debt is 40951. and it will be discharged in a year.

PROBLEM III.

Given the extremes and the number of terms, to find

1. The ratio.

This is found as in problem 2, by dividing the greater extreme by the less, and extracting such root of the quotient whose index is equal to the number of terms minus 1.

2. The sum of the series.

This is found as in problem 1.

$$\text{Thus, } r = \sqrt[n-1]{\frac{1}{a}}, \text{ and } s = \frac{1}{\frac{1}{a} \sqrt[n-1]{\frac{1}{a}} - 1} = \frac{1}{\frac{1}{a} \sqrt[n-1]{\frac{1}{a}} - \frac{1}{a} \sqrt[n-1]{\frac{1}{a}}}.$$

EXAMPLES.

1. Given the extremes 1 and 512, and the number of terms 10; to find the ratio, and the sum of the series.

Ans. The ratio is 2, and the sum is 1023.

2. If the extremes of a series, consisting of 12 terms, be 5 and 885735; what is the ratio, and the sum of the series?

Ans. The ratio is 3, and the sum is 1328600.

3. What debt can be discharged in a year by monthly payments in geometrical progression, whereof the first payment is 11. and the last 2048, and what will the ratio of the series be? - - Ans. The ratio will be 2, and the debt 40951.

SINGLE POSITION.

THIS rule is also called false position, or false supposition, because it makes a supposition of false numbers, as if they were the true ones, and by their means discovers the true numbers sought.

The

The single rule uses only one supposition, but the double rule two; whence come their names.

To the rule of position belong such questions as cannot be solved by the direct process by any of the former rules; and in which the required number or numbers do not ascend above the first power: such, for example, as most of the questions usually brought to exercise the reduction of simple equations in algebra. But it will not bring out true answers when the numbers sought ascend above the first power; for then the results are not proportional to their positions, nor the errors to the difference of the true number and each position; yet in all such cases it is a very good approximation, and in exponential equations, as well as many other things, succeeds better than perhaps any other method.

Those questions, in which the results are proportional to their suppositions, belong to single position: such are those which require the multiplication or division of the number sought by any number, or in which it is to be increased or diminished by itself any number of times, or by any part or parts of it. And those in which the results are not proportioned to their positions, belong to the double rule: such are those, in which the number sought is increased or diminished by some given number, which is no known part of the number required.

To work Questions in single Position.

Take any number, and perform the same operations with it as, in the question, are described to be performed with the number sought; then if the result be the same with that in the question, the supposed number is the number sought; but if it be not, say, As the result of your operation is to your position, so is the result in the question to the number required.

Note, 1 may be made a constant supposition in all the questions, and in most cases is better than any other number.

EXAMPLES.

1. A person after spending $\frac{1}{3}$ and $\frac{1}{4}$ of his money, has yet remaining 60l. what had he at first?

1. Suppose

1. Suppose he had at first 120l.

Then $\frac{1}{3}$ of 120 is 40

$\frac{1}{4}$ of it is 30

their sum is 70

which taken from 120

leaves 50

$$\text{And } 50:120::60 \frac{60 \times 120}{50} = \frac{60 \times 12}{5} = 12 \times 12 = 144.$$

2. Suppose he had 1l.

Then $\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12}$, and $1 - \frac{7}{12} = \frac{5}{12}$;

whence $\frac{5}{12}:1::60:1 \times 60 \times \frac{12}{5} = \frac{60 \times 12}{5} = 12 \times 12 = 144$, as before.

Proof.

$\frac{1}{3}$ of 144 is 48

$\frac{1}{4}$ of it is 36

their sum is 84

which taken from 144

leaves 60 as per question.

2. What number is that, which multiplied by 7, and the product divided by 6, the quotient may be 14?

Ans. 12.

3. What number is it that, which being increased by $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ of itself, the sum shall be 125l? - - - Ans. 60.

4. A general, after sending out a foraging $\frac{1}{2}$ and $\frac{1}{3}$ of his men, had yet remaining 700; what number had he in command? - - - - - Ans. 4200

5. A gentleman distributed 78 pence among a number of poor people, consisting of men, women and children; to each man he gave 6d, to each woman 4d. and to each child 2d. moreover, there were twice as many women as men, and thrice as many children as women. How many were there of each?

Ans. 3 men, 6 women, and 18 children.

6. One being asked his age, said, if $\frac{3}{4}$ of the years I have lived, be multiplied by 7, and $\frac{2}{3}$ of them be added to the product, the sum will be 292? what is his age?

Ans. 60 years.

DOUBLE

DOUBLE POSITION.

HAVING taken any two convenient numbers, for the positions, proceed with each, according to the conditions of the question, as if it were the true number sought, and find how much the results are different from the result in the question; next multiply each of these errors or differences by the other's position; then if the errors be of the same affection, that is if the results be both either too great or too little, divide the difference of the products by the difference of the errors, and the quotient will be the answer; but if the errors be of different affections, that is, if one result be too great and the other too little, divide the sum of the products by the sum of the errors, and the quotient will be the answer.

Or having found the errors, say, As the sum or difference of the errors, according as they are of a different, or the same kind, is to the difference of the suppositions, so is the least error to the correction of the supposition belonging to this error; which must be added to, or subtracted from it, according to the following conditions, viz. If the errors be of the same kind, add, or subtract the correction, to or from this supposition, according as it is greater or less than the other supposition; but if the errors be of different kinds add, or subtract, according as this supposition is the less or the greater of the two; and the sum, or difference will be the number sought.

Note, It is often of advantage to make 1 and 0 the two suppositions.

EXAMPLES.

1. What number is that, which being multiplied by 6, the product increased by 18, and the sum divided by 9, the quotient will be 20?

First, suppose 30 to be the number sought; then

$$\frac{30 \times 6 + 18}{9} = 10 \times 2 + 2 = 20 + 2 = 22; \text{ but ought to have been } 20; \text{ therefore the error is two in excess.}$$

Again

Again, suppose 18 to be the numbe sought; then

$$\frac{18 \times 6 + 18}{9} = 2 \times 6 + 2 = 12 + 2 = 14;$$
 but ought to be 20; therefore the error is 6 in defect; and the errors are of different kinds or affections.

Whence, by the first rule,
$$\frac{30 \times 6 + 18 \times 2}{2 + 6 = 8} = \frac{15 \times 3 + 9}{2} = \frac{54}{2} = 27,$$
 the number sought.

And by the second rule, $2 + 6 : 30 - 18 :: 2 : \frac{2 \times 12}{8} = 3,$ the correction; then $30 - 3 = 27,$ the number sought.

But to work this by the note, suppose first 0; then

$$\frac{0 \times 6 + 18}{9} = \frac{18}{9} = 2;$$
 but ought to be 20; therefore the error is 18 in defect. Again suppose 1; then

$$\frac{1 \times 6 + 18}{9} = \frac{24}{9} = \frac{8}{3} = 2\frac{2}{3};$$
 but should have been 20; therefore the error is $17\frac{1}{3}$ in defect also, and the errors are of the same kind.

Whence by the first rule,
$$\frac{0 \times 17\frac{1}{3} \cup 18 \times 1}{18 - 17\frac{1}{3}} = \frac{18}{\frac{2}{3}} = 9 \times 3 = 27,$$
 the number sought.

And by the second rule, $18 - 17\frac{1}{3} : 1 - 0 :: 17\frac{1}{3} ; \frac{17\frac{1}{3}}{\frac{2}{3}} = \frac{52}{2} = 26,$ the correction; then $1 + 26 = 27,$ the number sought.

2. A son, asking his father how old he was, receives the following answer: Your age is now $\frac{1}{4}$ of mine; but 5 years ago your age was only $\frac{1}{3}$ of mine at that time. What are their ages? - - - - - Anf. 80 and 20.

3. A workman was hired for 30 days, at 2s. 6d. per day, for every day he worked; but with this condition, that for every day he played he should forfeit 1s. Now it so happened, that, upon the whole he had 2l. 14s. to receive. How many of the days did he work? - - - Anf. 24.

4. A and B began to play together with equal sums of money: A first won 20 guineas, but afterwards lost back $\frac{2}{3}$ of what he then had; after which, B had 4 times as much as A. What sum did each begin with? - Anf. 100 guineas.

5. Two

5. Two persons, A and B, have both the same income : A saves $\frac{1}{3}$ of his ; but B, by spending 50l. per annum more than A, at the end of 4 years finds himself 100l. in debt. What doth each receive and spend per annum ?

Ans. They receive 125l. per ann. also A spends 100l. and B spends 150l. per annum.

PROMISCUOUS QUESTIONS.

1. **A** Was born when B was 21 years of age : How old will A be when B is 47 ; and what will be the age of B when A is 60 ? - - - - - Ans. A 26, B 81.

2. What difference is there between twice five and twenty, and twice twenty-five ? - - - - - Ans. 20.

3. What number taken from the square of 48 will leave 16 times 54 ? - - - - - Ans. 1440.

4. What number added to the thirty-first part of 3813 will make the sum 200l. ? - - - - - Ans. 77.

5. What number deducted from the 23d part of 29440 will leave the 64th part of the same ? - - - - - Ans. 820.

6. The remainder of a division is 325, the quotient 467, the divisor is 43 more than the sum of both : What is the dividend ? - - - - - Ans. 390270.

7. A person at the time of his out-setting in trade, owed 350l. and had in cash 5307l. 10s. in wares 713l. 7d. and in good debts 210l. 5s. 10d. Now after having traded a year he owed 703l. 17s. and had in cash 4874l. 9s. 4d. in bills 350l. in wares 1075l. 14s. 3 $\frac{1}{2}$ d. and in recoverable debts 613l. 13s. 10 $\frac{1}{2}$ d. What was his real gain that year ? - - - - - Ans. 329l. 4s. 1d.

8. Two persons depart from the same place at the same time, the one travels 30, the other 35 miles a day : How far are they distant after 7 days, if they travel both the same road, and how far if they travel in contrary directions ? - - - - - Ans. 35 and 455 miles.

9. A gentleman's daily expence is 4l. 8s. 1 $\frac{19}{365}$ d. and he saves 500l. in the year : What is his yearly income ?

Ans. 2107l. 12s.

10. Having a piece of land 11 poles in breadth, I demand what length of it must be taken to contain an acre, when

when four poles in breadth require 40 poles in length to contain the same - - - - - Ans. 14 pls. 3 yds.

11. If a gentleman, whose annual income is 1000l. spend 20 guineas a week, whether will he save or run in debt, and how much in the year? - - - - - Ans. 92l. debt.

12. In the latitude of London, the distance round the earth, measuring in the parallel of latitude is about 15550 miles, now as the earth turns round in 23 hours 56 minutes, at what rate per hour is the city of London carried by this motion from west to east? - - - - - Ans. $649\frac{25}{339}$ miles an hour.

13. In order to raise a joint stock of 10000l. A, B, and C, together subscribe 7950l. and D the rest: Now A and B are known together to have set their hands to 5800l. and A has been heard to say that he had undertaken for 550l. more than B. What did each proprietor advance? - - - - - Ans. A 3175, B 2625, C 2150 D 2050.

14. A tradesman increased his estate annually by 100l. more than $\frac{1}{4}$ part of it, and at the end of 4 years found that his estate amounted to 10342l. 3s. 9d. What had he at out-setting? - - - - - Ans. 4000l.

15. Paid 1012l. 10s. for 750l. taken in 7 years ago; at what rate per cent. per annum did I pay interest? Ans. 5l.

16. What is the interest of 720l. for 73 days, or $\frac{1}{3}$ of a year, at 3l. per cent. per annum? - - - - - Ans. 4l. 6s 4d. $3\frac{1}{3}$ qr.

17. Part 1200 acres of land among A, B, and C, so that B may have 100 more than A, and C 64 more than B.

Ans. A 312, B 412, and C 476.

18. Divide 1000 crowns, give A 120 more and B 95 less than C. - - - - - Ans. A 445, B 230, C 325.

19. To how much amounts the order, for which my factor, at the rate of $2\frac{1}{2}$ per cent. receives 22l. 10s.

Ans. 900l.

20. What sum of money will amount to 132l. 16s. 3d. in 15 months, at 5 per cent. per annum simple interest?

Ans. 125l.

21. Laid out 165l. 15s. in wine at 4s. 3d. a gallon; some of which receiving damage in carriage, I sold the rest at 6s. 4d. a gallon, which produced only 110l. 16s 8d. What quantity was damaged? - - - - - Ans. 433 gal.

22. A father divided his fortune among his sons, giving A 4 as often as B 3, and C 5 as often as B 6;

what

what was the whole legacy, supposing A's share were 5000l.
 Anf. 11875l.

23. A stationer sold quills at 10s. 6d. a thousand, by which he cleared $\frac{1}{3}$ of the money; but growing scarce, raised them to 12s. a thousand: what did he clear per cent. by the latter price? - - - Anf. 71l. 8s. 6 $\frac{1}{2}$ d.

24. If 1000 men besieged in a town, with provisions for 5 weeks, allowing each man 16oz. a day, were reinforced with 500 men more; and hearing that they cannot be relieved till the end of 8 weeks; how many ounces a day must each man have, that the provision may last that time?
 Anf. 6 $\frac{2}{3}$ oz.

25. If a quantity of provisions serve 1500 men 12 weeks, at the rate of 20 ounces a day for each man; how many men will the same provisions maintain for 20 weeks, at the rate of 8oz. a day for each man? - Anf. 2250 men.

26. In what time will the interest of 72l. 12s. equal that of 15l. 5s. for 64 days, at any rate of interest?
 Anf. 13 $\frac{16}{3}$ days.

27. A person possessed of $\frac{3}{8}$ of a ship, sold $\frac{2}{3}$ of his share for 1260l. what was the reputed value of the whole at the same rate? - - - Anf. 5040l.

28. What sum of money at 4 $\frac{1}{2}$ per cent. will clear 29l. 15s. in a year and a half's time? - Anf. 440l. 14s. 9 $\frac{1}{2}$ d.

29. What number is that, to which if $\frac{2}{7}$ of $\frac{5}{9}$ be added, the sum will be 1? - - - Anf. $\frac{5}{6}$.

30. A father dying left his son a fortune, $\frac{1}{4}$ of which he ran through in 8 months; $\frac{3}{7}$ of the remainder lasted him a twelvemonth longer, after which he had bare 410l. left. What did his father bequeath him?
 Anf. 956l. 13s. 4d.

31. Bought a quantity of goods for 250l. and 3 months after sold it for 275l. How much per cent. per annum did I gain by them? - - - Anf. 40.

32. A guardian paid his ward 3500l. for 2500l. which he had in his hand 8 years. What rate of interest did he allow him? - - - Anf. 5 per cent.

33. Bought a quantity of goods for 150l. ready money, and sold it again for 200l. payable at the end of 9 months; what was the gain in ready money, supposing rebate to be made at 5 per cent. - - - Anf. 42l. 15s. 5 $\frac{1}{2}$ d.

34. A person being asked the hour of the day, said, The time

time past noon is equal to $\frac{4}{5}$ ths of the time till midnight:
What was the time? - - - Ans. 20 min. past 5.

35. A person, looking on his watch, was asked what was the time of the day, who answered, It is between 4 and 5; but a more particular answer being required, he said that the hour and minute hands were then exactly together: What was the time? - Ans. $21\frac{9}{11}$ min. past 4.

36. With 12 gal. of canary at 6s. 4d. a gal. I mixed 18 gal. of white wine at 4s. 10d. a gal. and 12 gal. of cyder at 3s. 1d. a gal. At what rate must I sell a quart of this composition so as to clear 10 per cent? - Ans. 1s. $3\frac{5}{8}$ d.

37. Suppose that I have $\frac{3}{10}$ of a ship worth 1200l. what part of her have I left after selling $\frac{2}{5}$ of $\frac{4}{9}$ of my share, and what is it worth? - - - - - Ans. $\frac{37}{240}$, worth 185l.

38. What length must be cut off a board $8\frac{1}{2}$ inches broad, to contain a square foot, or as much as 12 inches in length and 12 in breadth? - - - - - Ans. $17\frac{13}{16}$ inches.

39. What sum of money will produce as much interest in $3\frac{1}{4}$ years, as 210l. 3s. can produce in 5 years and 5 months? - - - - - Ans. 350l. 5s.

40. There is gained by trading with a ship 120l. 14s. Now suppose that $\frac{1}{4}$ of her belongs to S, $\frac{3}{8}$ to T, $\frac{1}{8}$ to V, and the rest to W; what must each have of the gain? Ans. S 30l. 3s. 6d. T 45l. 5s. 3d. V 15l. 1s. 9d. W 30l. 3s. 6d.

41. If 100l. in 5 years be allowed to gain 20l. 10s. in what time will any sum of money double itself at the same rate of interest? - - - - - Ans. $24\frac{16}{11}$ years.

42. What difference is there between the interest of 350l. at 4 per cent. for 8 years, and the discount of the same sum at the same rate, and for the same time?

Ans. 27l. $3\frac{1}{3}$ s.

43. If, by selling goods at 50s. per cwt. I gain 20 per cent. what do I gain or lose per cent, by selling at 45s. per cwt. - - - - - Ans. 8l. gain.

44. If, by remitting to Holland, at 34s. 6d. per l. sterling, $4\frac{1}{2}$ per cent. be gained; how goes the exchange, when by remittance I clear 10 per cent. - - - - - Ans. 36s $3\frac{1}{2}$ d

45. Sold goods for 60 guineas, and by so doing lost 17 per cent. whereas I ought in dealing, to have cleared 20 per cent. Then how much under their just value were they sold? - - - - - Ans. 28l. 1s. $8\frac{2}{3}$ d.

46. If

46. If, by selling goods at 27d. per lb. I gain cent. per cent. what do I clear per cent. by selling for 9 guineas per cwt. - - - - - Ans. 50 per cent.

47. If 20 men can perform a piece of work in 12 days, how many will accomplish another thrice as big in one-fifth of the time? - - - - - Ans. 300

48. A younger brother received 6300l. which was just $\frac{7}{9}$ of his elder brother's fortune: What was the father worth at his death? - - - - - Ans. 14400l.

49. A person making his will gave to one child $\frac{1}{3}$ of his estate, and the rest to another; and when these legacies came to be paid, the one turned out 600l. more than the other: What did the testator die worth?

Ans. 2000l.

50. A father devised $\frac{7}{8}$ of his estate to one of his sons, and $\frac{7}{8}$ of the residue to another, and the surplus to his relict for life; the children's legacies were found to be 257l. 3s. 4d. different: Pray what money did he leave the widow the use of? - - - - - Ans. 635l. 10 $\frac{3}{4}$ d.

51. What number is that from which, if you take $\frac{3}{4}$ of $\frac{3}{8}$, and to the remainder add $\frac{7}{8}$ of $\frac{1}{20}$, the sum will be 10? - - - - - Ans. 10 $\frac{191}{240}$

52. There is a number which, if multiplied by $\frac{2}{3}$ of $\frac{7}{8}$ of $1\frac{1}{2}$, will produce 1: What is the square of that number?

Ans. $1\frac{1}{4}$.

53. A person dying left his wife with child, and making his will, ordered that if she went with a son, $\frac{2}{3}$ of his estate should belong to him, and the remainder to his mother; and if she went with a daughter, he appointed the mother $\frac{2}{3}$ and the girl the remainder: but it happened that she was delivered both of a son and a daughter; by which she lost in equity 2400l. more than if it had been only a girl: What would have been her dowry had she had only a son? - - - - - Ans. 2100l.

54. Three persons purchase together a ship, toward the payment of which A advanced $\frac{2}{5}$ and B $\frac{2}{7}$ of the value and C 200l. How much paid A and B, and what part of the vessel had C? Ans. A 90 $\frac{1}{3}$ l. B 116 $\frac{4}{7}$ l. C $\frac{1}{8}$ part.

55. A and B clear by an adventure at sea, 60 guineas, with which they agree to buy a horse and chaise, of which they were to have the use, in proportion to the sums

sums adventured, which was found to be A 9 to B 8; they cleared 45 per cent. What money then did each send abroad?

Ans. A 74l. 2s. 4 $\frac{4}{11}$ d. and B 65l. 17s. 7 $\frac{1}{11}$ d.

56. In an article of trade, A gains 18s. 3d. and his adventure was 40s. more than B's, whose share of profit is but 12s. What are the particulars of their stock?

Ans. A 5l. 16s. 9 $\frac{3}{4}$ d. and B 3l. 16s. 9 $\frac{3}{4}$ d.

57. Three persons entered joint trade, to which A contributed 240l. and B 210l. they clear 120l. of which 30l. belongs of right to C. Required that person's stock, and the several gains of the other two?

Ans. C's stock 150l. A gained 48l. and B 42l.

58. A and B in partnership equally divide the gain; A's money which was 96l. 12s. lay for 15 months, and B's for no more than 6: What was the adventure of the latter?

Ans. 24l. 10s.

59. Put out 420l. to interest, and in 6 $\frac{1}{2}$ years time there was found to be due 556l. 10s. What was the rate of interest?

Ans. 5 per cent.

60. A clears 12l. in 6 months, B 15l. in 5 months, and C, whose stock was 40l. clears 21l. in 9 months? What was the whole stock?

Ans. 125 $\frac{1}{2}$ l.

61. A had 12 pipes of wine which he parted with to B at 4 $\frac{1}{2}$ per cent. profit, who sold them to C for 40l. 12s. advantage; C made them over to D for 60s. 10s. and cleared thereby 6 per cent. How much a gallon did this wine cost A?

Ans. 6s. 8 $\frac{64}{1077}$ d.

62. A of Amsterdam, orders B of London to remit to C of Paris, at 52 $\frac{1}{2}$ d. ster. a crown, and to draw on D of Antwerp for the value at 34 $\frac{1}{4}$ s. flem. a l. ster. but as soon as B received the commission, the exchange was on Paris at 53d. a crown: pray at what rate of exchange ought B to draw on D, to execute his orders, and be no loser?

Ans. 34s. 2 $\frac{5}{33}$ d.

63. A, with intention to clear 20 guineas on a bargain with B, rates hops at 15d. a lb. which cost him 10 $\frac{1}{2}$ d. B, apprised of that, sets down malt, which cost 20s. a quarter, at an adequate price: For how much malt did they contract?

Ans. 49 qr.

64. A and B venturing equal sums of money, clear by joint trade 180l. By agreement A was to have 8 per

3 per cent. because he spent time in the execution of the project, and B was to have only 5 : What was allotted to A for his trouble ? - - - - - Ans. 41l. 10s. 9 $\frac{3}{4}$ d.

65. Laid out in a lot of muslin 500l. upon examination of which 3 parts in 9 proved damaged, so that I could make but 5s. a yard of the same; and by so doing find I lost 50l. by it. At what rate per ell am I to part with the undamaged muslin, in order to gain 50l. upon the whole ?

Ans. 11s. 7 $\frac{2}{7}$ d.

66. A at Paris, draws on B in London 1400 crowns, at 46d. ster. a crown, for the value of which B draws again on A at 57d. ster. a crown, besides reckoning commission $\frac{1}{2}$ per cent. Did A gain or lose by this transaction, and what ? - - - - - Ans. He gained 17 $\frac{1}{9}$ crowns.

67. A, B, and C are in company; A put in his share of the stock for 6 months, and laid claim to $\frac{1}{6}$ of the profits; B put in his for 9 months; C advanced 500l. for 8 months, and required on the balance $\frac{3}{5}$ of the gain: Required the stock of the other two adventurers?

Ans. A 185l. 3s. 8 $\frac{1}{2}$ d. and B 172l. 16s. 9 $\frac{1}{2}$ d.

68. A young hare starts 40 yards before a greyhound, and is not perceived by him till she has been up 40 seconds, she scuds away at the rate of 10 miles an hour, and the dog, on view, makes after her at the rate of 18: How long will the course hold, and what ground will be run over, beginning with the out-setting of the dog?

Ans. 60 $\frac{5}{2}$ sec. and 530 yards run.

69. If I leave Exeter at 8 o'clock on Monday morning for London, and ride at the rate of 3 miles an hour without intermission; and B set out from London for Exeter at 4 the same evening, and ride 4 miles an hour constantly: Supposing the distance between the two cities to be 130 miles, whereabouts on the road shall they meet?

Ans. 69 $\frac{3}{7}$ miles from Exeter.

70. A reservoir for water has two cocks to supply it; by the first alone it may be filled in 40 minutes, by the second in 50 min. and it hath a discharging cock, by which it may, when full, be emptied in 25 min. Now, supposing that these three cocks are all left open, and that the water comes in, in what time, supposing the influx and efflux of the water to be always alike, would the cistern be filled?

Ans. 3 hrs. 20 min.

71. A.

71. A sets out of London for Lincoln, at the very same time that B at Lincoln sets forward for London, distant 100 miles: After 7 hours they meet on the road, and it then appeared that A had rode $1\frac{1}{2}$ miles an hour more than B. At what rate an hour did each of them travel?

Ans. A $7\frac{2}{3}$, and B $6\frac{1}{3}$ miles.

72. A and B truck; A has $12\frac{1}{2}$ cwt. of Farnham hops, at 2l. 16s. a cwt. but in barter insists on 3l. B has wine worth 5s. a gal. which he raises in proportion to A's demand. On the balance A received but a hhd. of wine: What had he in ready money? - - Ans. 20l. 12s. 6d.

73. A of Amsterdam owes to B of Paris, 3000 guilders of current specie, which he is to remit to him, by order, the exchange 91d. Flem. de banco a crown, the agio 4 per cent. but when this was to be negotiated, the exchange was down at 90d a crown, and the agio 5 per cent. What did B get by this turn of affairs?

Ans. 5 liv. 12 sol. $8\frac{38}{1183}$ den.

74. If 100 eggs be laid down on the ground, in a straight line, one yard from each other, and the first of them one yard from a basket; what space shall a man walk over, in bringing the eggs one by one to the basket?

Ans. 10100 yds. or 5 miles 1300 yds.

N. B. The solutions, at full length of this collection of questions, are now printed in a pamphlet as a supplement to this arithmetic, and to be had separate.

A COURSE of BOOK-KEEPING according to the Method of SINGLE ENTRY, with a DESCRIPTION of the BOOKS, and DIRECTIONS for using them: Very useful either for young Book-keepers entering into Business, or for Masters to teach in their Schools.

IT is very necessary that almost every person who is intended for business, should learn a course of book-keeping of this kind, because it is used in almost every shop. The Italian method alone is not sufficient; for it is a constant complaint among the merchants, &c. who use this method, that their boys having learnt only the Italian method, when they first come to business, are almost as ignorant in the management of their books as if they had never learnt any method. There are some boys who have not time to learn, or perhaps a capacity to understand a complete course of the Italian method; there are also many intended for such kinds of business, as that the Italian method would be thrown away upon them: to all such then this method will be extremely useful. And even supposing a boy were intended for a business which requires the Italian method alone, I would, notwithstanding, have him taught this method first, if it were only to facilitate his acquisition of the other. This method is so easy, that it may also be taught in a few weeks time to young ladies as well as young gentlemen.

The forms of the books may be sufficiently known by inspection.—In the day-book, every person is written down *Dr.* to the things he receives from you on trust, and *Cr.* by those which you receive from him. In the margin of the day-book are written the pages where the accounts stand in the ledger: Instead of these marginal figures, some make only a stroke or dash with the pen, to shew that the account has been posted, that is, entered in the ledger; but it is better to use the figures, for they shew, not only that the account has been posted, but likewise where to find it in the ledger, without looking in the alphabet. In the day-book I have set down only the total amount of all the articles of each day collected into one sum; having purposely omitted the amount or value of each

single line or article, every one of which the learner is to compute by way of exercise and as it were in real trade, and enter in their proper columns in the day-book as he copies it out. Then the printed sum totals will shew him if he has computed the particulars rightly.

I have entered in the day-book what is received as well as what is delivered, which is absolutely necessary in teaching; for the learner ought to make out all his own ledger from his day-book.

There are several other books kept by most merchants, as the cash-book, the book of house expences, the invoice book, &c.

Directions for the Learner.

Having ruled your books in the proper form, copy into your day book one month's accounts, then calculate them upon your slate or waste paper, to find if they be rightly cast up, and to exercise you in calculations. Next rule your slate or waste paper in the form of the ledger, and upon it post the accounts that were copied in the day-book, with their dates prefixed, observing to set on the Dr. side of each person's account, those accounts to which he is Dr. in the day-book, and on the Cr. side those by which he is Cr. and if any account consist but of one article, you are to express it particularly with its money in the columns, but if of several, write to or by fundries, placing the sum of the amounts of all the articles in the columns. After the accounts are, by correcting, if necessary, placed according to the teacher's mind, transcribe them into your ledger, leaving a proper space under each person's name to receive more accounts. Then under the proper letters in the alphabet enter those names with the pages where they stand in the ledger; and, lastly, write the ledger pages to the several accounts in the day-book: Do the same with the next month's accounts, and so on till the whole be finished. —But observe that you must not enter any person's name down again which has been entered before, till the space first assigned to it shall be filled with articles; and then the account must be transferred to a new place, as you may observe is done with Lady Strawberry's account.

When

When the first ledger, titled A, is filled with accounts, you must, as is done with the following ledger, transfer the unbalanced accounts to the second ledger, titled B, &c. according to the order of the letters of the alphabet; and at the end of the old ledger draw out a balance account, placing your debts on one side, and your credits on the other.

THE DAY BOOK.

January 1, 1777.		l	s	d
1	<i>Mr. James Elford, of Bath, Dr.</i>			
	To 15 yds. of fine broad cloth at	13	6	
	— 24 - - superfine - -	18	9	
		32	12	6
1	<i>George Robson, Esq. of York, Dr.</i>			
	To 12 gal. palm-sack, at - -	8	6	
	— 17 — port, red - - -	5	8	
	— 9 — claret - - - -	8	9	
		13	17	1
1	<i>Mrs. Mary Masterman, Dr.</i>			
	To 1½ lb. green tea, at - -	16	0	
	— 2¼ — congou, at - - -	9	6	
	— 0¼ stone of sugar, at - -	5	0	
	— A lump of sugar wt. 20½ lb. at	0	8	
		3	0	3½
2	<i>Lady Strawberry, Dr.</i>			
	To 9½ yds. of silk, at - -	12	9	
	— 13 - - flowered ditto - -	15	6	
		16	2	7½
				January

January 20, 1777.		l	s	d
2	<i>Sir Jonas Moore, Dr.</i>			
	To a ream of thick post paper - - -	1	0	0
27				
2	<i>Mr. James Wilson, Schoolmaster, Dr.</i>			
			s	d
	To 6 Hutton's Arithmetics at - - -	2	3	
	— 3 doz. copy books - - -	2	6	
	— 2 quires foolscap - - -	0	10	
	— 1 quire thin post - - -	1	0	
		0	1	0
		1	3	8
Feb. 5.				
3	<i>Mr. Alderman Abelman, Dr.</i>			
			l.	s d
	To a ledger ruled - - -			15
	— 5 c. quills, at - - -	0	2	6
	— 3 reams thick post - - -	1	0	0
	— 6 quires pot - - -	0	0	8
	— 50 reams blue demy - - -	0	5	6
	— 2 penknives and an inkstand, - -			6
		15	17	6
12				
3	<i>William Winton, Esq. Dr.</i>			
			s	d
	To 20 oz. nutmegs, at - - -	0	3	
	— 5½ lb. coffee, - - -	4	0	
	— 3¼ — cocoa, - - -	2	4	
	— 4 — almonds, - - -	1	0	
	— 8½ — raisins, - - -	0	7	
		2	3	6½
20				
3	<i>Mr. William Watson, Dr.</i>			
			s	d
	To 2 gal. rum, at - - -	10	0	
	— 4 — brandy, - - -	10	6	
	— 3 — Eng. gin, - - -	5	0	
		3	17	0
				Feb.

DAY-BOOK.

149

Feb. 27, 1777		l	s	d
2	Sir Jonas Moore, Dr.			
	By cash received of him in full - - -	1	0	0
March 10				
4	Sir Jeffery Slingshott, Dr.			
	oz.dwt.gr. s d			
	To a silver punch-bowl } wt. 23 4 0 at 5 10			
	- a tankard - - 10 3 6 - 6 2			
	- a teapot and lamp 30 5 12 - 7 3			
	- 6 plates - - 73 11 5 - 6 1			
	- 18 spoons - - 41 0 10 - 6 3			
		56	1	4
22				
1	George Robson, Esq. of York, Dr.			
	To 27 $\frac{3}{4}$ gal. sherry - - - - at 6 2			
	- 22 $\frac{1}{2}$ - rhenish - - - - - 6 4			
	- 34 - Lisbon - - - - - 4 10			
		23	17	11 $\frac{1}{2}$
April 7				
4	Sir Thomas Lawton, Dr.			
	To 7 $\frac{1}{2}$ yds. of scarlet cloth - at 21 0			
	- 4 superfine blue - - - - 20 0			
	- $\frac{1}{4}$ velvet - - - - - 18 0			
	- 30 gold lace - - - - - 10 6			
		27	17	0
12				
2	Lady Strawberry, Dr.			
	To 11 $\frac{1}{4}$ yds. lustring - - - at 6 10			
	- 14 - brocade - - - - - 11 3			
		11	17	9 $\frac{1}{2}$
24				
1	Mrs. Mary Masterman, Cr.			
	By cash received of her in full - - -	3	0	3 $\frac{1}{2}$
	G 3			April

		April 25, 1777		1	s	d
4		<i>David Johnson, Esq. Dr.</i>				
			s d			
	To 5 gal. lamp oil	- - - at	4	2		
	- 3½ — train oil	- - - —	3	0		
	- ¼ — sweet oil at	- - - —	12	6		
					2	0 8½
1		May 3				
		<i>Mr. James Elford, of Bath, Dr.</i>				
			s d			
	To 27 yds. of yard-wide cloth	at	8	4		
	- 16 - - drugget	- - - —	6	3		
	- 12 - - serge	- - - —	2	10		
	- 32 - - shalloon	- - - —	1	8		
					20	12 4
4		10				
		<i>Sir Thomas Lawson, Dr.</i>				
			s d			
	To 7 yds. superfine black cloth	at	19	6		
	- 12 — shalloon	- - - —	2	4		
	- 1 doz. and 9 coat buttons	—	2	6		
	- 2 - - 8 waistcoat ditto	—	1	3		
					8	12 2½
5		14				
		<i>Mr. Nicholas Norton, of Durham, Dr.</i>				
			s d			
	To 9 pair worsted stockings	at	4	6		
	6 — silk ditto	- - - —	15	9		
	- 17 — thread	- - - —	5	4		
	- 23 — cotton	- - - —	4	10		
	- 14 — yarn	- - - —	2	4		
	- 18 — women's gloves	- - - —	4	2		
	- 19 yds. flannel	- - - —	1	7½		
					23	15 4½
4		20				
		<i>Sir Thomas Lawson, Cr.</i>				
	By a bill on Captain James Dixon	- -	10	0	0	

May

DAY-BOOK.

151

May 20, 1777									
4	<i>David Johnson, Esq. Dr.</i>								1 s d
		c	qr	lb		1	s	d	
	To 13	Cheeshire } wt. 5 3 12		at	1	2	6		
		cheeses. }							
	— 25	Gloucester — 3 0 18		—	1	8	0		
	— 47	Stilton — 1 2 5		—	2	4	8		
									17 7 10
									26
5	<i>Mrs. Shields, Dr.</i>								d
	To 8	lb. rice - - - -		at	4	1	2		
	— 3 1/2	— currants - - - -		—	5				
	— 2	quarts vinegar - - - -		—	6				
									0 5 5 1/2
									June 3
5	<i>Capt. James Dixon, Dr.</i>								qr. bush.
	To 7	3 of wheat - - - -		at	1	8	c		
	— 9	7 -- rye - - - -		—	1	1	6		
	— 17	4 -- oats - - - -		—	0	10	8		
									30 5 5 3/4
									12
4	<i>Sir Jeffery Slingstone, Cr.</i>								
	By a bank note received by the servant								20 0 0
									17
1	<i>Mrs. Mary Mafferman, Dr.</i>								s d
	To 14	lb. hard soap - - - -		at	0	6			
	— 7	— soft - - - -		—	0	5			
	— 3 1/2	— starch - - - -		—	0	5 1/2			
	— 3 1/2	— blue - - - -		—	1	4			
	— 40	— raisins - - - -		—	0	4 1/2			
	— 3	doz. candles - - - -		—	5	9			
									2 8 5 1/4
									21
1	<i>Mrs. Mafferman, Cr.</i>								s d
	By 40 yds. Ruffia sheeting								at 2 2
									G 4
									June

8 1/2

4

1 1/2

June 28, 1777			l	s	d
4	<i>David Johnson, Esq. Dr.</i>				
			l	s	d
	To 17 lb. cream cheese	- at	0	0	7 $\frac{1}{2}$
	- 53 stone 3 lb. bacon	- -	0	4	8
	- 15 $\frac{1}{2}$ fir. butter	- -	1	8	0
			34	12	11 $\frac{1}{2}$
July 3					
6	<i>Miss Fanny Dawson of Liverpool, Dr.</i>				
			s	d	
	To 14 yds. blue ribbon	- - at	0	7 $\frac{1}{2}$	
	- 21 - white	- - -	0	6	
	- 12 $\frac{1}{2}$ - lace	- - -	3	6	
	- 9 pair kid gloves	- - -	2	4	
			4	4	0
7					
2	<i>Mr. James Wilson, Schoolmaster, Cr.</i>				
	By cash received in full	- - - -	0	18	5
10					
6	<i>Mr. Roger Retail, of Newcastle upon Tyne, Dr.</i>				
			s	d	
	To 24 $\frac{1}{2}$ lb. royal green tea	- at	18	6	
	- 21 $\frac{1}{4}$ - imperial	- - -	24	0	
	- 35 $\frac{3}{4}$ - best bohea	- - -	13	10	
	- 17 $\frac{3}{8}$ - coffee	- - -	5	4	
	- 25 double refined sugar	- - -	1	1 $\frac{1}{2}$	
	- 9 sugar loaves, wt. 137 lb.	- - -	0	7 $\frac{1}{2}$	
			83	5	9
17					
6	<i>Mr. Charles Anderson, Dr.</i>				
			s	d	
	To 6 mahogany chairs	- - at	18	6	
	- 2 elbow ditto	- - -	25	0	
	- 2 pier glasses	- - -	36	0	
			11	13	0

July

DAY-BOOK.

153

July 24, 1778		l	s	d
6	<i>Mr. Charles Anderson, Dr.</i>			
			s	d
	To 25 yds. curtain stuff - - at	2	2	
	- 12 - - ticking - - - - -	1	3	
	- 3 stone of feathers - - - -	25	0	
	- 2 pier tables - - - - -	50	0	
		12	4	0
28				
5	<i>Capt. James Dixon, Dr.</i>			
			s	d
	To 12 bush. peas - - - at	2	9	
	- 9 - - beans - - - - -	3	5	
	- 17 - - malt - - - - -	4	8	
	- 25 lb. hops - - - - -	1	4	
		8	16	5
August 1				
3	<i>William Winton, Esq. Dr.</i>			
			s	d
	To 10 grofs of bottles - - at	22	0	
	- 9 - - small ditto - - -	15	0	
	- 2 doz. of wine glaffes - -	4	6	
	- 3 decanters - - - - -	1	2	
		18	7	6
7				
3	<i>Mr. Alderman Ableman, Cr.</i>			
	By a note upon Cr. James for - - -	10	0	0
	- cash in full - - - - -	5	17	6
		15	17	6
12				
4	<i>David Johnson, Esq. Cr.</i>			
	By cash, in part - - - - -	50	0	0
16				
6	<i>Mr. Charles Anderson, Cr.</i>			
	By 5 pockets of hops, at 48s. - - -			

G 5

August

August 18, 1777		l	s	d
6	<i>Mr. Charles Anderson, Dr.</i>			
	To a mahogany bed-stead - - - -		s	d
	— 2 stools, at - - - - - 5	2	10	0
	— poker, tongs, and fender - - -	1	0	0
	— 2 other sets of irons, at - - - 15			0
		5	10	6
21				
7	<i>Mr. Conrade Compound, of Exeter, Dr.</i>			
	To 21 $\frac{3}{8}$ lb. cochineal - - at 29		s	d
	— 6 $\frac{1}{4}$ — opium - - - - 6			4
	— 53 $\frac{1}{8}$ — scammony - - - - 8			10
		56	19	5
26				
7	<i>Mr. John Baker, Dr.</i>			
	To 5 gross of brass buttons at 18		s	d
	— 2 - - white - - - - 15			0
	— 7 doz. pair of buckles - 2 2 a pair			
	— 12 trunk locks - - - - 0 10 each			
	— 6 chamber ditto - - - - 2 6			
		16	7	0
Sept. 3				
7	<i>Mrs. March, Dr.</i>			
	To 8 sarcenet hoods, at - - - - 4		s	d
				3
4				
2	<i>Mr. James Wilson, Schoolmaster, Dr.</i>			
	To 6 Hutton's Arithmetics - at 2		s	d
	— 1 thouf. pinions - - - - -			3
	— 3 doz. copy-books - - - - - 2	0	2	6
	— 3 quires of thin post - - - - 1			0
	— Lowth's Eng. grammar - - - -	0	2	4
		1	8	10

Sept.

DAY-BOOK.

155

Sept. 6, 1777				l	s	d
2	<i>Lady Strawberry, Dr.</i>	s	d			
	To 12 $\frac{1}{4}$ yds. fatten - at - - -	10	8			
	9					
5	<i>Mr. Nicholas Norton, Cr.</i>					
	By a bank note for - - - - -	20	0	0		
	12					
2	<i>Lady Strawberry, Dr.</i>	s	d			
	To 11 $\frac{3}{8}$ yds. velvet - at - - -	18	0			
	16					
2	<i>Mr. James Wilson Schoolmaster, Dr.</i>					
	To the universal penman - - - -	1	5	0		
	18					
7	<i>Mrs. March, of Chester, Dr.</i>					
	To 17 India fans, at 3s 10d					
	18					
1	<i>Mrs. Mary Masterman, Dr.</i>					
	To cash in full - - - - -	1	18	2 $\frac{3}{4}$		
	22					
2	<i>Lady Strawberry, Dr.</i>					
	By cash received of the steward - - -	20	0	0		
	24					
6	<i>Mr. Charles Anderson, Cr.</i>					
	By cash in full - - - - -	17	7	8		
	27					
7	<i>Mrs. March, Dr.</i>	s	d			
	To 21 yds. silver ribbon, at - - -	2	2			
	- 11 $\frac{1}{2}$ fine lace - - - - -	10	6			
				8	6	3
	Oct. 2.					
8	<i>Mr. Samuel Edwards, Dr.</i>					
	To 14 lb flax, at 1s - - - - -					
	4					
8	<i>Mr. R. Barber, Bristol, Stationer, Cr.</i>					
	By 30 reams of foolscap paper, at 12s 6d					
	6					
8	<i>Lady Strawberry, Dr.</i>					
	To 27 $\frac{1}{2}$ yds. of Holland, at 5s 6d - -					

156 BOOK-KEEPING by SINGLE ENTRY.

		l	s	d
	Oct. 6, 1777			
4	David Johnson, Esq. Cr.			
	By cash in full - - - - -	4	1	6
	10			
9	Mr. Mathew Milton, of Norwiche, Dr.			
	To 40 ells of dowlas - - at - 1 6			
	— 34 - - diaper - - — - 1 4½			
	— 31 - - Holland - - — - 5 8			
	14	2	5	
	13			
8	Lady Strawberry, Dr.			
	To 40 yds. of Irish cloth, at 3s 4d - -			
	15			
9	Mr. Henry Foster, Dr.			
	To 2½ cwt. iron, at 18s 9d - - - -			
	21			
9	Mrs. Mary Gray, Cr.			
	By 3 ps. Irish cloth, quant. 87 yds. at 2s 2d			
	23			
7	Mr. John Baker, Cr.			
	By cash in part - - - - -	10	0	0
7	Mrs. March, Dr.			
	To 9 pair of kid gloves, - at - 2 2			
	— 5 doz. pair lamb's ditto — - 1 2			
	— 12 pieces of bobbin - — - 0 6			
	4	15	6	
	25			
8	Lady Strawberry, Cr.			
	By cash in full - - - - -	39	0	5
	27			
1	George Robson, Esq. Cr.			
	By cash in full - - - - -	37	15	0½

Oct.

DAY-BOOK.

157

		l	s	d
8	Oct. 30, 1777 Mr. Samuel Edwards, Dr.			
	To 12lb. of flax - - - at			d
	- 14 - - - - -			10
		9		
	Nov. 4	1	0	6
9	Mr. Mathew Milton, Cr.			
	By 30 gal. brandy at 8s 6d - - -			
	- cash, in full - - - - -	1	7	5
		14	2	5
10	7 Samuel Simpson, Esq. Dr.			
	To 3 sugar loaves, wt. 32½lb. at 8½d			
	13			
1	Mr. James Elford, Cr.			
	By a bill for - - - - -	50	0	0
	15			
5	Captain James Dixon, Cr.			
	By 3 ps. of Holland, qt 112½ ells, at 7s 6d			
5	Captain James Dixon, Dr.			
	To cash, in full - - - - -	3	1	10½
	20			
10	Samuel Simpson, Esq. Dr.			
	To 15½lb. of currants, at 4d - - -			
	22			
10	Mr. Thomas Grey, Dr.			
	To 2 doz. knives and forks at	15	0	
	- a set of china - - - - -	2	10	0
	- 18 china plates - - - - -	2	3	
	- 3 dishes - - - - -	4	6	
	- a mahogany tea-board - - -	0	10	6
		7	4	6

Nov.

158 BOOK-KEEPING by SINGLE ENTRY.

	Nov. 26, 1777	1	s	d
10	Mr. Thomas Grey, Cr. By 42 ells of Holland, at 5s 6d - -			
	28			
4	Sir Jeffery Slingstone, Cr. By cash, in full - - - - -	36	1	4
	29			
10	Samuel Simpson, Esq. Dr.			
	To 17½ lb. Malaga raisins - at 0 5½			
	- 19½ - raisins of the fun - 0 6			
	- 17 - rice - - - - - 0 3½			
	- 8½ - pepper - - - - - 1 6			
	- 13 oz. cloves - - - - - 0 9			
		1	4	10½
	Dec. 1			
2	Mr. James Wilson, Schoolmaster, Cr. By cash, in full - - - - -	2	13	10
	3			
3	Mr. Alderman Ableman, Dr. To a pipe of wine - - - - -	25	0	0
	6			
3	William Winton, Esq. Cr. By 30 gal. brandy, at 7s 6d - - -			
	- cash in full - - - - -	9	6	0½
		20	11	0½
	8			
10	Mr. Thomas Hunter, Dr. To 3 chaldrons of coals, 1l 15s - -			
	10			
3	Mr. William Watson, Cr. By cash, in full - - - - -	3	17	0
	12			
11	Peter Thompson, of Worcester, Esq. Dr. To 5 butts of oil, wt. 55 cwt. 1 qr. 20 lb. gross, tare 18 lb. a cwt. at 24l. 10s. a tun of 236 gal. and 7½ lb. neat to the gallon - - - - -	72	2	5¼

Dec.

DAY-BOOK.

159

	Dec. 13, 1777	l	s	d
9	<i>Mr. Henry Foster, Cr.</i>			
	By cash, in full - - - - -	2	6	10½
	15			
4	<i>Sir Thomas Lawson, Cr.</i>			
	By 3 c. 2 qr. 14lb. of tobacco, at 4l. a cwt.			
	18			
5	<i>Mrs. Shields, Dr.</i>			
	To a lump of sugar, wt. 22¾lb. at 8½d.			
	20			
10	<i>Samuel Simpson, Esq. Cr.</i>			
	By cash, in full - - - - -	3	13	0½
	22			
6	<i>Miss Fanny Dawson, Cr.</i>			
	By cash, in full - - - - -	4	4	•
	23			
11	<i>Mr. Edward Young, Dr.</i>			
	To 3 cwt. 1 qr. cheese, at 3os. - - -			
	24			
6	<i>Mr. Roger Retail, Cr.</i>			
	By a bill upon Thomas Williams, Esq. for	50	0	0
	Mr. Shields, Cr.			
5	By cash, in full - - - - -	1	1	6¾
	29			
7	<i>Mrs. March, Cr.</i>			
	By cash, in full - - - - -	18	0	11

Ledger A.

THE ALPHABET.

A <i>Alder. Abelman</i> 3 <i>Mr. C. Anderson</i> 6	B <i>Mr. J. Baker</i> 7 <i>Mr. R. Barber</i> 8 <i>Balance</i> 11	C <i>Mr. C. Compound</i> 7
D <i>Capt. J. Dixon</i> 5 <i>Miss F. Dawson</i> 6	E <i>Mr. J. Elford</i> 1 <i>Mr. S. Edwards</i> 8	F <i>Mr. H. Foster</i> 9
G <i>Mrs. M. Gray</i> 9 <i>Mr. T. Grey</i> 10	H <i>Mr. T. Hunter</i> 10	I <i>D. Johnson, Esq.</i> 4
K	L <i>Sir. T. Lawson</i> 4	M <i>Sir J. Moore</i> 2 <i>M. Masterman</i> 1 <i>Mrs. March</i> 7 <i>Mr. M. Milton</i> 9
N <i>Mr. N. Norton</i> 5	O	P
Q	R <i>G. Robson, Esq.</i> 1 <i>Mr. R. Retail</i> 6	S <i>L. Strawberry</i> 2, 8 <i>Sir J. Slingstone</i> 4 <i>Mrs. Shields</i> 5 <i>S. Simpson, Esq.</i> 10
T <i>P. Thompson, Esq.</i> 11	V	W <i>Mr. J. Wilson</i> 2 <i>W. Winton, Esq.</i> 3 <i>Mr. W. Watson</i> 3
X	Y <i>Mr. E. Young</i> 11	Z

LEDGER A.

161

(1) Mr. James Elford, of Bath, Cr.

1777 Jan. 1	Dr.	To sundries	- - -	1777 Nov. 12	By a bill for	- - -	50	0	0
May 3		To sundries	- - -		By account at fol. 1, ledger B	- - -	3	4	10
							53	4	10
1777 Jan. 1	Dr.	To sundries	- - -		Robson, Esq. of York.	Cr.			
Mar. 22		To sundries	- - -	1777 Oct. 27	By cash, in full	- - -	37	15	0 1/2
1777 Jan. 4	Dr.	To sundries	- - -		Masterman,	Cr.			
June 17		To sundries	- - -	1777 Apr. 24	By cash, in full	- - -	3	0	3 1/2
Sept. 18		To cash, in full	- - -	June 21	By 40 yds. of sheeting, at 2s 2d	- - -	4	6	8
							7	6	11 1/2

(2)		Dr.		Lady Strawberry,		Cr.	
1777				1777			
Jan. 9	To sundries	-	-	Sept. 22	By cash, received of the Steward	20	0
Apr. 12	To sundries	-	-		By account at fol. 8	24	15
Sept. 6	To 12 $\frac{1}{4}$ yds. fatten, at 10s. 8d.	-	-			-	10
12	To 11 $\frac{1}{8}$ yds. velvet, at 18s.	-	-			44	15
						10	49
						44	15
						10	10
1777		Dr. Sir Jonas		1777		Moore	
Jan. 20	To a ream of paper	-	-	Feb. 27	By cash in full	1	0
						0	0
1777		Dr. Mr. James		1777		Wilson, Schoolmaster,	
Jan. 27	To sundries	-	-	July 7	By cash, in full	1	3
Sept. 4	To sundries	-	-	Dec. 1	By cash, in full	2	13
12	To the universal penman	-	-			13	10
						3	17
						6	6

(3)

Dr.

Mr. Alderman Ableman,

Cr.

(4)		Sir Jeffery Slingstone,		Cr.	
Dr.	Cr.	1777	1777	1777	1777
Mar. 10	To sundries	56 1 4	June 12	By a bank note	20 0 0
			Nov. 28	By cash, in full	36 1 4
					56 1 4
		Lawson, Cr.			
1777		1777			
April 7	To sundries	27 17 0	May 20	By a bill on Capt. James Dixon	10 0 0
May 10	To sundries	8 12 2½	Dec. 15	By 3 c. 2 qr. 14 lb. tobacco, at 4	14 10 0
		36 9 2½		By account at fol 1, ledg. B	11 19 2½
					36 9 2½
		Johnson, Esq. Cr.			
1777		1777			
April 25	To sundries	2 0 8½	Aug. 12	By cash, in part	50 0 0
May 20	To sundries	17 7 10	Oct. 6	By cash, in full	4 1 6
June 28	To sundries	34 12 11½			54 1 6
		54 1 6			

(5)

Dr.

Mr. Nicholas Norton of Durham,

Cr.

LEDGER A.

[illegible]

Dr.		Miss Fanny Dawson of Liverpool.		Cr.		
1777		l	s d	1777	l s d	
July 3	To sundries - - -	4	4 0	Dec. 22	By cash, in full - - -	4 4 0
	Dr. Mr. Roger Retail,			of	Newcastle upon Tyne, Cr.	
1777				1777		
July 10	To sundries - - -	83	5 9	Dec. 24	By a bill - - - - - By account at fol. 2, ledg. B	50 0 0 33 5 9
	Dr. Mr. Charles				Ander ^{son} , Cr.	83 5 9
1777				1777		
July 17	To sundries - - -	11	13 0	Aug. 16	By 5 pockets of hops, at 28s.	12 0 0
24	To sundries - - -	12	4 2	Sept. 24	By cash, in full - - -	17 7 8
Aug. 18	To sundries - - -	5	10 6			29 7 8

(7) Dr. *Mr. Conrade Compound, of Exeter, Gr.*

(7)

Dr. Mr. Conrade Compound, of Exeter,

Cr.

1777

Aug. 21

To sundries

l s d

56 19 5

Dr.

Mr. John

1777

Aug. 26

To sundries

1777

O&A. 23

16 7 0

Dr.

Mrs. March

1777

Sept. 3

To 8 farcenet hoods, at 4s 3d

17 To 17 India fans, at 3s 10d

29 To sundries

O&A. 23 To sundries

114 0

3 5 2

8 6 2

4 15 3

180 11

of

1777

Dec. 6

By cash, in full

18 0 11

Chester, Cr.

LEDGER A.

167

By account at fol. 2, ledg. B

Baker, Cr.

By Cash, in part

By account at fol. 3, ledg. B

l s d

56 19 5

10 0 0

16 7 0

16 0 0

(8)		Dr.		Mr. Samuel Edwards,		Cr.			
1777				l	s	d	l	s	d
O&A.	2	To 14lb. flax at 1s.	-	-	-	0	14	0	6
	30	To sundries	-	-	-	1	0	6	
						1	14	0	
		Dr.		Mr. R. Barber,					
				l <th>s</th> <th>d</th> <td>l<th>s</th><th>d</th></td>	s	d	l <th>s</th> <th>d</th>	s	d
				18	15	0			
		To account at fol. 3, ledg B.							
				l <th>s</th> <th>d</th> <td>l<th>s</th><th>d</th></td>	s	d	l <th>s</th> <th>d</th>	s	d
		Dr.		Lady					
1777				l <th>s</th> <th>d</th> <td>l<th>s</th><th>d</th></td>	s	d	l <th>s</th> <th>d</th>	s	d
O&A.	6	To account from fol. 1	-	-	-	24	15	10	
	6	To 27½ yds. Holland at 5s 6d				7	11	3	
	13	To 40 yds. Irish cloth. at 3s 6d				6	13	4	
				39	0	5			
				l <th>s</th> <th>d</th> <td>l<th>s</th><th>d</th></td>	s	d	l <th>s</th> <th>d</th>	s	d
		Dr.		of					
				l <th>s</th> <th>d</th> <td>l<th>s</th><th>d</th></td>	s	d	l <th>s</th> <th>d</th>	s	d
		1777							
				l <th>s</th> <th>d</th> <td>l<th>s</th><th>d</th></td>	s	d	l <th>s</th> <th>d</th>	s	d
				18	15	0			
		By 40 reams of foolscap at 12s. 6d.							
				l <th>s</th> <th>d</th> <td>l<th>s</th><th>d</th></td>	s	d	l <th>s</th> <th>d</th>	s	d
		Dr.		Strawberry					
				l <th>s</th> <th>d</th> <td>l<th>s</th><th>d</th></td>	s	d	l <th>s</th> <th>d</th>	s	d
		1777							
				l <th>s</th> <th>d</th> <td>l<th>s</th><th>d</th></td>	s	d	l <th>s</th> <th>d</th>	s	d
				39	0	5			
		By cash, in full							
				l <th>s</th> <th>d</th> <td>l<th>s</th><th>d</th></td>	s	d	l <th>s</th> <th>d</th>	s	d
		O&A. 29							
				39	0	5			

(9)

Dr.

Mr. Matt. Milos, of Norwich, account of 4th & 5th E. B.

1777

1 s d

1777

1 s d

Oct. 10

To sundries

14 2 5

Nov. 4

By sundries

14 2 5

1777

Dr.

Mr. Henry

1777

Foster,

Cr.

Oct. 1

To 2½ cwt. of iron, at 18s. 9d.

2 6 10½

Dec. 13

By cash, in full

2 6 10½

Dr.

Mrs. Mary

1777

Gray,

Cr.

To account at fol. 3, ledg. B

9 8 6

Oct. 21

By 3 ps. Irish cloth, qt. 87 yds.

5 8 6

at 2s. 2d.

- - -

- - -

Dec. 8 1830

(11)

(11)		Dr.		Peter Thompson, of Worcester, Esq.		Cr.		LEDGER A.		171			
		l		s		d		l		s		d	
1777	Dec. 12	To 5 butts of oil	-	-	-	72	2	5½	By account at fol. 4, ledg. B	72	2	5½	-
'1777		Dr.	Mr. Edward						Young,				
Dec. 23		To 3c. 1qr. cheese, at 30s.				4	17	6	By account at fol. 4, ledg. B	4	17	6	-
1777		Dr.	Balance						Cr.				
		To Mr. J. Elford, due to me				3	4	10	By Mr. R. Barber	18	15	0	-
		To Mr. Alderman Ableman				25	0	0	By Mrs. Mary Gray	9	8	6	-
		To Sir Thomas Lawton				11	19	2½	By Mr. Thomas Grey	4	6	6	-
		To Mr. Nicholas Norton				5	15	4½					
		To Mr. Roger Retail				33	5	5					
		To Mr. Conrade Compound				56	19	5					
		To Mr. John Baker				6	7	0					
		To Mr. Samuel Edwards				1	14	6					
		To Mr. Thomas Hunter				5	5	0					
		To Peter Thompson, Esq.				72	2	5½					
		To Mr. Edward Young				4	17	6					
						124	11						

Ledger B.

THE ALPHABET.

A <i>Alder. Ableman</i> 1	B <i>Mr. J. Baker</i> 3 <i>Mr. R. Barber</i> 3	C <i>Mr. C. Compound</i> 2
D	E <i>Mr. J. Elford</i> 1 <i>Mr. S. Edwards</i> 3	F
G <i>Mrs. M. Gray</i> 3 <i>Mr. T. Grey</i> 4	H <i>Mr. T. Hunter</i> 4	I
K	L <i>Sir. T. Lawson</i> 1	M
N <i>Mr. N. Norton</i> 2	O	P
Q	R <i>Mr. R. Retail</i> 2	S
T <i>P. Thompson, Esq.</i> 4	V	W
X	Y <i>Mr. E. Young</i> 4	Z

	Dr.	Mr. James Elford, of Bath,	Cr.
1778	To account at fol. 1, ledg. A	3 4 10	
	Dr. Mr. Alderman		Ableman. Cr.
1778	To account at fol. 3, ledg. A	25 0 0	
	Dr. Sir Thomas		Lawson. Cr.
1778	To account at fol. 4, ledg. A	11 19 2½	

(2)	Dr.	Mr. Nicholas Norton, of Durham,	Cr.		
				l	s
1778	To account at fol. 5, ledg. A	315	4½		
	Dr. Mr. Roger Retail,				
1778	To account at fol. 6, ledg. A	33	5		
	Dr. Mr. Conrade				
1778	To account at fol. 7, ledg. A	56	19		
		of	Newcastle upon Tyne, Cr.		
		Compound of Exeter,	Cr.		

(3)

Dr.

Mr. John Baker,

Cr.

1778

To account at fol. 7, ledg. A

6 7 0

1 1 5 0

Dr.

Mr. Samuel

Edwards, Cr.

1778

To account at fol. 8, ledg. A

1 14 6

Dr.

Mr. R. Barbit

Bristol, Cr.

of

By account at fol. 8, ledg. A

18 15 0

Dr.

Mrs. Mary

Grey, Cr.

1778

By account at fol. 9, ledg. A

5 8 6

LEDGER B.

175

(4)	Dr.	Mr. Thomas Grey,	1778	By account at fol. 10, ledg. A	Cr.
	Dr.	Mr. Thomas	1778	To account at fol. 10, ledg. A	Cr.
	Dr.	Peter Thompson,	1778	To account at fol. 11, ledg. A	Cr.
	Dr.	Mr. Edward	1778	To account at fol. 11, ledg. A	Cr.

BOOK-KEEPING BY DOUBLE ENTRY.

Or, according to the ITALIAN METHOD.

THIS method is said to be by Double Entry, because every article is twice entered in the Ledger, viz. on the Dr. side of one account, and on the Cr. side of another; and it is called the Italian Method because of its having been invented in Italy.

In this method we generally consider three books, viz. the Waste Book, the Journal, and the Ledger; of each of which I shall give a short account.

I. *Of the WASTE BOOK.*

The Waste Book contains an Inventory of a person's effects and debts, with a distinct history of all his transactions in a way of trade, narrated in a plain, simple stile, and in order of time as they succeed one another.

The Waste Book opens with an inventory of the person's effects and debts; which, when he first sets out in trade is to be gathered from a survey of the particulars that make up his real estate; but ever after it is to be collected from the balance of his old books, and carried to the new ones.

After this foundation is laid, all transactions in trade are set down simply as they happen, specifying their dates, the names, &c. of the persons dealt with on trust, the conditions of bargains, prices of goods, with the sums of money, or any thing else that may be necessary to make the transactions easily understood; the manner of doing all which will appear from a review of the following specimen of a Waste Book.

II. *Of the JOURNAL.*

In the Journal, or Day Book; the transactions recorded in the Waste Book are prepared to be carried to the ledger, by having their proper debtors and creditors ascertained and pointed out.

It agrees with the Waste Book in the form or manner of ruling, of dating, and in the order of succession of

the accounts according to their dates; but differs from it by having the debtors and creditors of all accounts specified.

On the right hand margins of each folio or page of the journal and waste book, are ruled three columns for pounds, shillings, and pence; and on the left-hand margins a column to receive the figures expressing the folios or pages where the same accounts are entered in the succeeding book, viz. in the waste book margin are set the corresponding journal pages; and in the journal margin, the ledger pages.

III. *Of the LEDGER.*

In the ledger the several articles of each account are collected from the different pages of the journal through which they are scattered, and disposed all in one place appointed for them; the debtor parts of the accounts being placed on one side of the folio, and the creditor parts of the same accounts on the other side of the same folio, and directly facing the former parts, by which disposition all the transactions relating to each account appear at one view, and in one place.

From the other books then the ledger differs very considerably: each folio or page of it is divided in the middle, from top to bottom, into two equal spaces or sides, the left side receiving the debtor articles, and the right side the creditor articles of the accounts; and titled, at the top, *Dr.* and *Cr.* respectively; with the name or title of the account in the middle between, and upon a line with, the said titles of *Dr.* and *Cr.* The right-hand margin of each side is ruled into three columns for money, and one for the figures expressing the folios where the same articles stand on the other side of the folio of some other accounts; and on the left-hand margin is formed a column for the dates of the articles.

The ledger hath belonging to it an Index or Alphabet, in which the titles of the accounts are entered under their initial letters, with the figures of the pages in which they stand; by means of which they are readily found.

DIRECTIONS for the LEARNER.

Having ruled your books according to the forms of the following specimens, copy into your waste book the first month's transactions as they stand in the following waste book, but omitting the left-hand marginal figures, which are to be inserted according to the directions afterwards given. Then calculate every article, to find if they be right, and to make yourself ready at calculations.

THESE articles are then to be entered, one by one, in the journal, and according to the journal form, and as soon as any article is entered in the journal, turn to the same article in the waste book, and directly against it in the margin write the number of the folio where it stands in the journal. As to the form of entering in the journal, having written the date in the same manner as in the waste book, observe the two following articles :

1. In a simple post, viz. in which only one debtor and one creditor are concerned, let the *Dr.* be expressly mentioned, then the *Cr.* and lastly the sum, all in one line; below which insert the narrative, or reason of the entry, in one or more lines, in a full and particular manner, so that the whole of the transaction may easily be understood.

2. In a complex post, let the sundry *Drs.* or *Crs.* be expressed in the first line by the word *sundries*, and the rest of the line filled up as in the former case. After which, let the several *Drs.* or *Crs.* be particularly mentioned, each in a line by itself, with their respective sums adjoined to them; which are to be added up, and their total carried to the money columns — In this case observe also that, in mentioning the several *Drs.* or *Crs.* the *Crs.* take the word *To* before them, but the *Drs.* are expressed simply, without any word prefixed.

FARTHER, in any entry, to know what to make *Dr.* and what *Cr.* observe the following rules :

1. Things received are *Drs.* and things delivered are *Crs.* consequently, a thing received is *Dr.* to the thing given for it.

2. A thing received on trust, is *Dr.* to the person of whom it is received.

3. The person to whom a thing is delivered on trust, is *Dr.* to the thing delivered.

4. In antecedent and subsequent cases, parts that are naturally the reverse of one another, are also opposed in respect of terms.

5. In cases where personal and real *Drs.* or *Crs.* are wanting, the defect must be supplied by fictitious ones, according to your judgement.

6. In complex cases, the several *Drs.* or *Crs.* are to be made out from the preceding rules jointly taken.

The fictitious *Drs.* and *Crs.* that are mostly used, are 1. *Stock*, which is made *Cr.* for the effects in the inventory, and *Dr.* for the debts in it; 2. *Profit and Loss*, which is made *Dr.* for every sum delivered for which nothing is expected as an equivalent, and for losses upon bargains or goods; and *Cr.* for the contrary sums, viz. for all gains upon goods, &c. 3. *Voyage to such a place*, which is made *Dr.* for things sent as an adventure, and all expences upon them; and *Cr.* for their neat proceeds. And several others, as may be seen in the following course of books.

HAVING finished the journal entries for the month, you then proceed to post them into the ledger; by writing down every article twice, once on the *Dr.* side, and once on the *Cr.* side, viz. on the *Dr.* side of that account which is *Dr.* and on the *Cr.* side of that which is *Cr.* having first appointed spaces for these accounts by estimation large enough to contain all their articles, and titled them according to the description of the ledger, and entered such titles in their proper places in the alphabet immediately on writing them in the ledger. In entering the *Dr.* side article, you write down the name of the *Cr.* preceded by the word *To*, and immediately after, in the line, the conditions of the article, such as price, quantity, &c. placing the whole sum of money in the columns with the folio figure where the *Cr.* stands, and prefixing to the whole its particular date: and in entering the *Cr.* side article, write down the name of the *Dr.* preceded by the word *By*, writing the *Dr.* folio number, and the date, money, &c. as before. This done, turn to the article in the journal,
and

and against it in the left-hand margin write the *Dr.* and *Cr.* folio numbers, the former above the latter, with a line between, like a vulgar fraction: but when there are several *Drs.* in a journal post, the *Cr.* folio number need be but once entered, viz. under the lowest *Dr.* number; and when there are several *Crs.* write the *Dr.* folio number above only the upper *Cr.* number.

HAVING, in this manner, posted all the journal entries for the month into the ledger, write another month's accounts in the waste book, from thence to the journal, and thence to the ledger, as before; after this go through the next month, and so on till the whole be finished; transposing from one folio to another, in the ledger, such accounts as happen to be too large to be contained in the spaces first assigned to them, as is done with the *cash* and *profit and loss* accounts in the following ledger.

HAVING posted all the accounts into the ledger, let them be balanced thus: let all accounts have their sums of money on both sides added up into two totals; but before these totals are set down, if they be unequal, let the sides be made equal (*i. e. balanced*) by writing down on the lighter side as much as will make it equal the heavier, which sum is generally charged *Dr. to*, or *Cr. by* either *Profit and Loss* or *Balance*, these being the two accounts by which most others are balanced: all cases, in which any thing is either gained or lost, being balanced by means of *Profit and Loss*; and all those in which goods or any thing remains in your hands, or in which any thing is due to or by you, are closed by means of the *Balance* account, which is drawn out at the end of the ledger to receive all such balances into; and the articles closed by *Profit and Loss* being carried to the *Profit and Loss* account. By these means all the gains and losses are collected into one place under the title of *Profit and Loss*, and all the effects and debts into another under the title of *Balance*; and therefore by closing or balancing these two general accounts by means of the stock account, and carrying the two equalling sums to their proper sides of the stock account, those two sides then added up, will be exactly equal to each other; otherwise the work is some where wrong, and must be examined

mined till the error be rectified.—Some accounts are closed by means both of *Profit and Loss*, and *Balance*; for where any thing remains on hand, it is first set down on the less side by charging *Balance* with it at prime cost or the original value, after which the whole account must be equalled by *Profit and Loss*.

THE books are then finished, and in beginning a set of new ones, make out the inventory, in the new waste book, from the balance of the ledger; for the inventory consists of all the articles in the balance account of the old ledger.

Additional Observations.

INSTEAD of writing in the direction of the length of the page, after the manner of the ledger printed in this book, you may easily vary or alter the form of your ledger as you please, ruling the columns either across the leaves or from top to bottom, and in this case placing the *Dr.* articles on the left-hand page, and the *Cr.* articles facing them on the right-hand page, if the leaves of your book are very narrow; but if their breadth will admit of it, place both *Drs.* and *Crs.* on one leaf, dividing it down the middle for that purpose.

Some teachers think it best to use only a waste book and ledger; and those who think so, may easily direct their pupils to post immediately into the ledger from the specimen of waste book here printed, and omit the journal. And of this opinion is an ingenious preceptor who sent me the following collection of plain and particular rules or cases, which may be used either with or without a journal.

Rules for making Transfers from a Day-Book to a Ledger, according to the Italian Method of Double Entry; adapted to the Specimen, in p. 188, &c. By Mr. A. CROCKER.

CASE I.

THE first transfer which is to be made, is of the stock, &c. which you have in hand, or whatever you owe, at the time you begin your accounts:—you must, therefore, make

make each article which you are possessed of, (expressing the prices per yard, cwt. &c. as well as the quantities) debtor to stock; the same of a person who owes money; and then make stock creditor by sundries for the whole value, or for each article separately for its value.—Also, you must make stock *Dr.* to sundries for what you owe; and each article which you owe for (expressing the prices and quantities, or person whom you owe any thing to) creditor by stock.

2. When you buy goods for ready money.—Make the goods, (expressing price and quantity) *Dr.* to cash; and cash *Cr.* by the goods, without expressing the price per yard or quantity.

3. When you buy goods on credit.—Goods (expressing price and quantity) *Dr.* to the person bought of, and the person *Cr.* by goods.

4. When you buy goods for part money and part credit.—Goods, (expressing price and quantity) *Dr.* to sundries; and cash *Cr.* by goods, for as much as was paid, and the person of whom bought, *Cr.* also, by as much as remains due.—If part be paid by bill drawn by you, on some other person, you must make the person, on whom it is drawn, *Cr.* by bill, expressing its value, and to whom payable.

5. When you buy goods and pay a bill on another for their value.—Goods (expressing price and quantity) *Dr.* to the person on whom the bill is drawn; and the drawee *Cr.* by bill on him, payable to the person of whom you bought goods.

6. When you buy a share of a ship.—The ship (calling it by its name) *Dr.* to cash, (expressing your share) and cash *Cr.* by ship, mentioning your share and sum paid.

7. When you take goods from another beyond the seas at your own risk.—Goods (expressing price and quantity) *Dr.* to voyage, mentioning from whence; and the voyage *Cr.* by goods.

8. When you receive goods to sell for another, and pay any charges for freight, &c.—The person's goods *Dr.* to cash (expressing for what) and cash *Cr.* by freight on person's goods.

9. When you sell goods for ready money.—Cash *Dr.* to goods, without mentioning price or quantity, and goods (expressing price and quantity) *Cr.* by cash.

10. When

10. When you sell goods on credit.—The person, to whom sold, *Dr.* to goods, (the price and quantity of which may, or may not be expressed) and goods *Cr.* by the person (expressing price and quantity.)

11. When you sell goods, for part money and part credit —Cash *Dr.* to goods, for the sum received; and the buyer *Dr.* to goods for the remainder; and goods, (expressing price and quantity) *Cr.* by fundries.

12. When you barter one kind of merchandize for other kinds of merchandize of equal value.—Make goods received *Dr.* to goods delivered (expressing price and quantity) and goods delivered *Cr.* by goods received, expressing also price and quantity.

13. When you dispose of goods for part barter, and the remainder cash.—Goods received *Dr.* to goods delivered for the value of goods received, and cash also *Dr.* for what you receive; and goods disposed of *Cr.* by fundries.

14. When you sell goods, and receive a bill on another person for payment.—The person on whom the bill is drawn, is made *Dr.* for a bill received of the drawer, or indorser, and goods (expressing price and quantity) *Cr.* by bill, expressing on whom drawn.—Or bills receivable may be made *Dr.*

15. When you sell goods, for part cash, and the remainder a bill.—Cash *Dr.* to goods for what is paid in cash; and Bills receivable *Dr.* to the other part; and goods, (expressing price and quantity) *Cr.* by fundries.

16. When you send goods to a factor, on your own account.—Voyage, or adventure *Dr.* to goods, expressed either by the word fundries, or each particular, as you will; and goods (expressed particularly, as well as the price and quantity) *Cr.* by voyage or adventure: also cash *Cr.* by charges of custom, &c.

17. When goods are sent to a person, desiring him to sell them for you, or return them.—Suspence account *Dr.* to goods; and goods (expressing price and quantity) *Cr.* by suspence account.

18. When you sell for ready money, any goods which were sent to you to sell for another.—Cash *Dr.* to the person's goods, and the person's goods *Cr.* by cash.

19. When you have sold all, and charge the person commission.—Person's goods *Dr.* to profit and loss for your

your commission, and profit and loss *Cr.* by the person's goods.

20. When you send goods to another person, beyond the seas, to sell on your account.—Voyage to the place where sent, *Dr.* to sundries; and goods, under each title (expressing price and quantity) *Cr.* by voyage to said place; also, cash *Cr.* by charges of customs, &c.

21. When you send a person goods, to sell, in partnership with yourself.—The person's account in *Co.* *Dr.* to goods, for your own share, and person himself *Dr.* to goods for his share, expressing in both, price and quantity; and goods (expressing price and quantity) *Cr.* by sundries.

22. When you sell goods in partnership.—Cash *Dr.* to goods, in company, mentioning the partner's name, and goods (expressing price and quantity) *Cr.* by cash.

23. When you sell goods in partnership on credit.—Person to whom sold *Dr.* to goods in company; and goods (expressing price and quantity) *Cr.* by the person to whom sold. If part be paid, and part remain due; the person and cash are respectively *Dr.* to goods in company, and the goods *Cr.* by sundries.

24. When goods in company, which have been sold on credit, are paid for.—Cash *Dr.* to the person, and the person *Cr.* by cash.

25. When you pay money.—The person to whom it is paid *Dr.* to cash, (expressing whether in full or part,) and cash *Cr.* by the person.

26. When you pay money, or discharge a debt by draft, or bill on some other person.—The person to whom the bill is delivered *Dr.* for a bill (expressing on whom drawn, and the sum) and the person on whom it is drawn, *Cr.* by bill, payable to him to whom it is delivered, expressing the sum.

27. When you lend money on bond, or other security.—The person to whom it is lent (expressing the sum and security) *Dr.* to cash; and cash *Cr.* by the borrower, expressing the security.

28. When you pay servants' wages, house expences, &c.—Profit and loss *Dr.* to servants' wages, &c. and cash *Cr.* by servant's wages, &c.

29. When you receive money which was due to you.—Cash *Dr.* to a person who pays; and the person *Cr.* mentioning whether in part or in full.

30. When

30. When you receive a share of the profits of a ship.—Cash *Dr.* to ship; and ship *Cr.* by cash for share of the profit.

31. When you receive interest for money lent.—Cash *Dr.* (expressing for what) to profit and loss; and profit and loss (expressing for what) *Cr.* by cash.

32. When you receive cash for a bill before due.—Cash *Dr.* to bills receivable (expressing from whom) and bills receivable *Cr.* by cash, expressing likewise from whom.

33. When you have a legacy left you.—The executor *Dr.* to profit and loss; and profit and loss *Cr.* by executor.

34. When you pay charges on a voyage, to or from a place.—Voyage *Dr.* to cash (expressing for what) and cash *Cr.* by voyage.

35. When you receive a freight of a ship.—Cash *Dr.* to ship; and ship *Cr.* by cash (mentioning for freight.)

36. When you insure a ship.—Ship *Dr.* to cash for insurance; and cash *Cr.* by ship for insurance.

37. When you pay for repairs of a ship.—Ship *Dr.* to cash for repairs; and cash *Cr.* by ship for repairs.

38. When you pay charges on goods in company.—Goods in company *Dr.* to cash; and cash *Cr.* by goods in company.

39. When you pay your partner his share of neat proceeds, on goods, in partnership sold; deduct commission and charges, and make person *Dr.* to cash for his share of neat gain on goods, and cash *Cr.* by person for his share of neat gain on goods. Also, cash *Dr.* to goods for the whole, and goods *Cr.* by cash.

40. When you receive principal and interest of a bond, or other security.—Cash *Dr.* to person paying money (mentioning the security) and person *Cr.* by cash in full for principal, and profit and loss for interest.

41. When a *Dr.* fails, and makes a composition.—Cash *Dr.* for what you receive, and profit and loss *Dr.* for what you lose by him; and the person himself *Cr.* by sundries in full.

42. When you draw a bill on a person.—Cash *Dr.* to drawee, and drawee *Cr.* by cash.

43. When you barter goods of different sorts, for different sorts of other goods.—Person with whom you barter, *Dr.* for sundries, and each sort of goods delivered (expressing price and quantity) *Cr.* by person; again each sort of goods received (expressing price and quantity) *Dr.* to person, of whom received; and the person *Cr.* by sundries.

44. When

44. When goods are bartered for other goods of equal value.—Goods received (expressing price and quantity) *Dr.* to goods delivered (the price of which, may or may not be expressed) and goods delivered (expressing price and quantity) *Cr.* by goods received, the price of which may or may not be expressed.

45. When returns are made of a suspense account.—Goods returned (expressing price and quantity) *Dr.* to suspense account; and suspense account *Cr.* by goods returned, without expressing price and quantity.

46. When you receive advice of the sale of goods, sent on a voyage.—The person to whom the goods were consigned, *Dr.* to the voyage; and the voyage *Cr.* by the same person.

47. When the person, to whom you made consignment of any goods, makes a remittance in goods.—Voyage from the place *Dr.* to the person, on account current; and the person *Cr.* by voyage from the place, from whence he sendeth the goods; but if the remittance be made by bills, the person's account current *Cr.* by bills receivable; and bills receivable (mentioning on whom drawn) *Dr.* to the person's account current.

48. When you receive goods consigned to you.—Goods, (expressing price and quantity of each sort) *Dr.* to voyage, &c. and voyage *Cr.* by sundries.

49. When you buy a ship in partnership with another.—Ship (calling it by its name) *Dr.* for your share paid; and cash *Cr.* by ship.

50. When a person to whom you have delivered goods to sell, in partnership, has sold them, and made return.—Cash, or goods received *Dr.* to the person; and the person *Cr.* by cash or goods.

51. When you send goods to a person according to his order.—Person to whom sent *Dr.* to goods, expressing price and quantity) and goods (expressing price and quantity) *Cr.* by the person.—If there be sundry sorts of goods ordered for, and such as you have not got in your warehouse, but procure them upon commission, you may make the person's account current *Dr.* to sundries; and each article *Cr.* by the person's account current.

All or most of these rules are applied in the following accounts.

THE

THE WASTE BOOK.

LONDON, January 1, 1778.

<i>An Inventory of the money, goods, and debts</i>		l	s	d
<i>due to or by me A — B —.</i>				
1	I have in ready money - -	5000	0	0
-	- 300 yds. superfine broad cloth at 15s. a yard	225	0	0
-	- 1200 yds. linen, at 2s 6d. a yard - - -	150	0	0
-	- 800 pieces lead weighing in all 44 ton, at 16l. a ton	704	0	0
-	- 25 puncheons rum, at 38l. a puncheon - -	950	0	0
-	- 12 hhds. sugar, containing 140 cwt. cost	304	6	0
-	- $\frac{3}{4}$ of the ship Endeavour	300	0	0
-	- William Johnson owes me per note due the 1st March - -	200	0	0
-	- James Gibson per bond with interest at 5 per cent. from the 1st November last	500	0	0
		8333	6	0
	<i>I owe as follows :</i>			
1	To Edward Young on demand	120	0	0
-	- Charles Wilson, Esq. due the 12th instant	87	4	0
-	- William Mercer, per account	65	10	6
		272	14	6

Jan.

Jan. 4, 1778		l	s	d
2	Bought 400 yds. shalloon, at 1s 3d a yard	25	0	0
7				
2	Paid Edward Young, in full - - -	120	0	0
12				
2	Bought of Isaac Onflow 18 hhds. Oport wine, at 9l. a hhd. - - -	162	0	0
17				
2	Paid to Charles Wilfon, Esq. in full -	87	4	0
2	Sold 150 yds. linen, at 3s. 2d. a yard -	23	15	0
24				
2	Bought of Timothy Clarkfon 12 bags hops, qt. 40 cwt. 2 qr. at 46s. a cwt. payable in 2 months - - -	93	3	0
30				
2	Bartered 5 puncheons rum, at 40l. a puncheon for 20 hhds. Lisbon wine, at 10l. a hhd. - - -	200	0	0
Feb. 2				
2	Sold Thomas Draper 100 yds. of broad cloth, at 18s. a yard - - -	90	0	0
6				
2	Shipped on board the Diligence, Captain Tempest, for Jamaica, the following goods, addressed to Abel Factor, on my account, viz.			
	800 yds. linen, at 2s. 6d. a yard	100	0	0
	200 — broad cloth, at 15s.	150	0	0
	8 pieces of Holland, bought of Tho. Draper, at 19l. a piece }	152	0	0
	Paid duty and fees, &c. - -	21	4	2
	Ditto for insurance of 400l. by Hazard and Co. at 5 per cent }	20	0	0
		443	4	2

Feb.

		Feb. 8, 1778			1	s	d
3	Bought of Charles Wilson, Esq. 1500 yds. Scotch linen, at 2s. 4d. a yard.						
	Paid him part in money - - -	50	0	0			
	Given him a bill on Thomas Draper for - - - - -	50	0	0			
	Rest due in a month - - - - -	75	0	0			
					175	0	0
		12					
3	Sold to Isaac Onslow 20 puncheons rum, at 44l. a puncheon - - - - -				880	0	0
		19					
3	Given William Mercer a bill upon Isaac Onslow for - - - - -				50	0	0
		23					
3	Bought of Thomas Draper 20 pieces Holland, at 18l. a piece - - - - -				360	0	0
		27					
3	Paid Thomas Draper, in full - - -				472	0	0
		March 4					
3	Received of William Johnson, in full - - -				200	0	0
		7					
3	Lent James Dixon, upon bond, at 5 per cent. - - - - -				1000	0	0
		9					
3	Sold Charles Wilson, Esq. 20 tons lead, at 19l. - - - - -				380	0	0
		14					
3	Sold David Robinson 54 cwt. sugar, at 2l. 16s.						
	Received in part - - - - -	100	0	0			
	Rest due in 2 months - - - - -	51	4	0			
					151	4	0

March

5

March 14, 1778		1	s	d
4	Sold Eugene Arden 23 cwt. 2 qr. hops, at 50s. a cwt. for payment of which he has given me a bill on Timothy Clarkson, payable at sight	58	15	0
22				
4	Bought of George Wood 500 yds. broad cloth, at 12s. 6d. for which have given him a bill on Isaac Onslow	312	10	0
27				
4	Paid William Mercer in full	15	10	6
30				
4	Paid my servants their quarters wages, which together with the expences of my house and pocket, &c. for the last quarter, is in all	93	4	10
April 2				
4	Bartered 300 yds. broad cloth, at 14s. a yard, for 10 pieces Indian chintz, of the same value, at 21l. a piece	210	0	0
5				
4	The owners of the Ship Endeavour have settled the accounts of the said ship, and paid me my share of neat gain from Michaelmas to Lady-day	94	13	8
9				
4	Received of Isaac Onslow, in full	355	10	0
4	Bartered 15 tons lead, at 18l. a ton, for the following goods of the same value, viz. 200lb. tea, at 12s. a lb. 120 0 0 12 bales muslin, at 12l. 10s. a bale 150 0 0	270	0	0
15				
5	Paid Timothy Clarkson, in full	34	8	0

April

		April 24, 1778		1		s		d	
5	Bartered 15 hhds. Lisbon wine, at 11l.								
	10s. a hhd. for								
	1 cwt. cochineal, valued at		120	0	0				
	The balance I have received		52	10	0				
	in money - - - - -								
						172	10	0	
		May 1							
	Bartered with Thomas Young,								
	250 yds. of linen, at 3s. a yard		37	10	0				
5	And 9 tons lead, at 18l. a ton		162	0	0				
						199	10	0	
5	For 120 lb. cinnamon, at 8s.								
	4d. a lb. - - - - -		50	0	0				
	And 12 bags cotton, qt. 34 cwt.		120	15					
	2 qr. at 3l. 10s. a cwt.					170	15	0	
		3							
5	Sold 40 cwt. sugar, at 58s. a cwt. for which								
	received a bill for 50l. on Samuel Ward,								
	due in 30 days, and 66l. in cash		116	0	0				
		8							
TI	Shipped on board the Speedwell, John								
Nº	Gibson, master, by order, and for ac-								
1	count of Timoleon Jansen, merchant, in								
2	Leghorn, the following goods, marked,								
	and numbered as per margin, viz.								
	200 yds. my own broad cloth,		140	0	0				
	at 14s. - - - - -								
5	10 ton lead, presently bought		162	0	0				
	for ready money, at 16l. 4s.								
	16 pieces druggat, at 7l. 7s		117	12	0				
	bought of James Horton								
	Paid custom and other charges		12	8	7				
	till on board - - - - -								
	Paid Hazard and Co. for insur-		10	10	0				
	ing 400l. on the whole								
	My commission on ditto, at 2½		11	1	3				
	per cent. - - - - -								
						453	11	0	

May 13, 1778		l	s	d
Sent William Lawfon, at Bristol.				
6	1000 yds. Scotch linen, at 2s 6d	125	0	0
	And 400 yds. shalloon, at 1s 5d	28	6	8
	Desiring him to take them at the above prices, or return them on my charges.	153	6	8
17				
6	Received of James Gibson for a half year's interest of 500l due the 1st inst.	12	10	0
25				
6	Drawn my bill on Timoleon Jansen, in Leghorn, for 1200 piastres, at 50d each, payable to James Johnston, or order, for value here received	205	0	0
June 3,				
6	Received of David Robinson, in full	51	4	0
7				
6	Received of Sam. Ward for the bill on him	50	0	0
19				
6	Sold William Johnson, 12 pieces Holland, at 20l a piece	240	0	0
28				
6	Received 500 yds Scotch linen, returned by William Lawfon, he keeping the other 500 yds. and the shalloon.	62	10	0
28				
7	Received from Abel Factor, of Jamaica, sales of 800 yds. linen, 200 yds. broad cloth, and 8 pieces of Holland, by the Diligence, Capt. Tempest, on my account; neat proceeds amounting to 794l. 13s. 4d. currency, exchange at 40 per cent.	567	12	4

		June 28, 1778	1	s	d
7	Received from Abel Factor, of Jamaica, invoice of 8 puncheons rum, 8 barrels indigo, and 6 hogsheads sugar, shipped by him on board the Diligence, on my account and risk, amounting to 487l. 16s. 10d. currency, exchange at 40 per cent.		348	9	2
		July 4			
7	My uncle Humphrey Adams is dead, and hath left me a legacy, payable by his executor James Gibson, the sum is		300	0	0
		8			
7	Paid house and shop rent, and servants wages, which together with house-keeping and other expences till Midsummer, amount in all to		130	0	0
		13			
7	Drawn my bill on Abel Factor, of Jamaica, payable to Edward Young, on order for value due by ditto-Young at 14 days		219	3	2½
		23			
7	Ship Diligence is arrived safe with my goods from Jamaica; freight, duty, and other charges paid here, amount to		83	4	8
8	Sold David Robinson my 6 hogsheads sugar on the key				
	Received in part - - -	70 0 0			
	Rest due in 6 months - - -	70 0 0			
			140	0	0
		25			
		Brought into my warehouse			
8	My 7 puncheons rum, at 23l.	161 0 0			
	And 8 barrels indigo, containing 125 lb. per barrel, at 2s. 3d. a lb.	112 10 0			
			273	10	0
					July

July 30, 1778		1	s	d
8	Received of Edward Young in full for my bill on Abel Factor	219	3	$\frac{1}{2}$
August 2				
8	Received from on board the Dolphin, James Scot, master, the following goods, to sell for Frederick Van Dyke, merchant in Amsterdam, viz. 5 butts currants and 12 casks raisins.			
	Paid custom, freight, warfage, portorage, &c.	12	14	6
7				
8	Received of William Lawfon, in part	50	0	0
10				
8	Sold Frederick Van Dyke's 5 butts currants, qt. 84 cwt. at 1l. 12s. a cwt.	134	8	0
14				
9	Sold to James Dixon, for account of Frederick Van Dyke, his 12 casks raisins, qt. 76 cwt. at 2l. a cwt.	152	0	0
17				
9	Paid storage, brokerage, &c. on Van Dyke's goods.	2	0	6
26				
9	My commission on 301l. at $2\frac{1}{2}$ per cent comes to	7	10	6
36				
9	Shipped on board the Dolphin, James Scot, master, the following goods, by order of Frederick Van Dyke.			
	My 46 cwt. sugar, at 56s.	128	16	0
	6 hhd. tobacco, for which I have paid	40	6	4
	Paid custom and other charges	8	12	3
	My commission at $2\frac{1}{2}$ per cent.	4	8	10
		182	3	5

September 2, 1778		l	s	d
9	Remitted Frederick Van Dyke a bill of 866 guilders, drawn by Thomas Young on James Joliffe, merchant, in Amsterdam, value paid here, exchange at 35s. 6d.	81	6	$\frac{1}{2}$
<hr/>				
9	Received of James Dixon 6 months interest of 1000l.	25	0	0
<hr/>				
September 20				
10	Shipped on board the Shark, Capt. Blunt for Hamburgh, the following goods addressed to James Conyers, on my account, viz.			
	My 34 cwt. 2 qr. cotton, at } 3l. 10s.	120	15	0
	Also my 10 pieces India chintz, } at 21l.	210	0	0
	Paid custom and other charges	24	7	8
		355	2	8
<hr/>				
24				
10	Sold James Dixon 12 hhd. Oporto wine, at 10l. a hhd. for payment of which he hath given me a bill on William Jones, due at 3 days.	120	0	0
<hr/>				
30				
10	Received as my share gained by the ship Endeavour since Lady-Day	58	3	2
<hr/>				
October 4				
10	Received of William Jones, in full of J. Dixon's bill	120	0	0
<hr/>				
8				
10	Delivered to William Anderson 12 bales muslin, at 12l. 10s. a bale, to sell for our account, each one half	150	0	0
<hr/>				
October				

October 8, 1778		l	s	d
10	The expence of my house, shop, servants, &c. till Michaelmas is	110	3	4
12				
10	Received of William Anderson, in full for his half share of 12 bales muslin	75	0	0
14				
11	Paid William Anderson, for my half share 12 hhds. tobacco, which he has bought on our joint account	72	0	0
11	Bought of Adam Ainsley, for account of Samuel Edwards and myself in company each a half, 14 hhds. tobacco, at 5l. 1cs. Due on demand	77	0	0
16				
11	Paid the owners of the Ship Swallow, each one-half of said ship, bought of then in company with Samuel Edwards	920	0	0
21				
11	William Anderson having disposed of our muslin and tobacco, hath paid me my share of neat proceeds, as follows, viz.			
	15 pieces kerseys, at 6l.	90	0	0
	A bill on George Drake for	50	0	0
	The rest in money, viz.	53	7	4
		193	7	4
24				
11	Received of Nicholson and Company, affreighters of the ship Swallow, for one months freight, advanced by them, on account of her voyage to Lisbon	25	0	0
11	Paid premium of 9ool. insured on the ship Swallow, for her voyage to Lisbon, at $1\frac{1}{2}$ per cent.	13	0	0

October 25, 1778		l	s	d
12	Paid Hugh Adams, for repairs of the ship Swallow, as per his account - - -	14	6	4
12	Sold our 14 hhds. tobacco at 7l.	98	0	0
26				
12	Paid carriage and other charges on our tobacco - - - - -	2	7	3
28				
12	Paid Adam Ainsley in full for tobacco	77	0	0
30				
12	My commission on the purchase, sales, and charges on our tobacco at 2 per cent. is	3	10	11
12	Paid Samuel Edwards, in full of his half share of neat proceeds on tobacco	7	10	11
November 2				
12	Shipped on board the Active, Capt. Brown the following goods in company with Edmund Ellis and Nicholas Norton, each $\frac{1}{3}$ to the address of Peter Thornton of Lisbon, viz.			
	Furnished by Edm. Ellis,			
	650 yds. broad cloth at 15s.	487	10	0
	Furnished by Nich. Norton,			
	120 pieces flannel at 36s. - -	216	0	0
	Furnished by me,			
	15 pieces kerseys at 6l. a piece	90	0	0
	8 pieces Holland at 18l. - -	144	0	0
	Duty and fees of entry, &c. } paid by me - - - - -	28	10	0
	Paid also for premium of insuring 90cl. on said goods, per Hazard and Co. at 2 per cent. - - - - -	18	0	0
		984	0	0

November

November 4, 1778.		l	s	d
13	Nicholas Norton and I have paid Edmund Ellis, on account of the above cargo, our proportions to make our shares equal, viz.			
	Paid by Nicholas Norton - - - - -	112	00	
	Paid by me - - - - -	47	10	0
		159	10	0
13	Received of James Gibson in full of his bond with the interest due the 1st inst.			
	The principal is - - - - -	500	00	
	The interest comes to - - - - -	12	10	0
		512	10	0
6				
13	James Dixon having failed, I have compounded his debt at 15s. per. l. viz.			
	Received for myself - - - - -	750	00	
	Received for F. V. Dyke - - - - -	114	00	
	Allowed for myself - - - - -	250	00	
	Ditto for F. V. Dyke - - - - -	38	00	
		1152	00	0
8				
13	Bought of George Emerson, in company with Edmund Ellis and Nich. Norton, 18 pipes Madeira, at 25l. - - -	450	00	0
9				
13	Received of William Lawfon in full -	40	16	8
11				
13	We have paid George Emerson in full for our Madeira as follows, viz.			
	Edmund Ellis has given him } goods to the value of -	94	00	
	Nicholas Norton hath counted } with him for - - -	170	00	
	I have paid him the rest in money	186	00	0
		450	00	0

November 11, 1778.		l	s	d
13	Edmund Ellis hath evened our accounts by paying			
	To Nich. Norton - - - - -	20	0	0
	And to me - - - - -	36	0	0
		56	0	0
12				
14	Sold William Wright 4 pipes madeira in co. with Edmund Ellis and Nicholas Norton, at 27l.	108	0	0
13				
14	Sold James Thompson 3 pipes of our madeira, at 28l.			
	Received in part - - - - -	34	0	0
	Rest due in two days - - - - -	50	0	0
		84	0	0
15				
14	Bartered 11 pipes of our madeira, at 28l. for 14 pipes canary wine, at 22l.	308	0	0
16				
14	Received of William Wright in full for madeira - - - - -	108	0	0
19				
14	Paid James Horton in full for Timoleon Janfen's druggets - - - - -	117	12	0
23				
14	Compounded with James Thompson, who has failed, as follows, viz.			
	Composition received - - - - -	30	0	0
	Remainder allowed him - - - - -	20	0	0
		50	0	0
27				
14	Sold Thomas Young my cwt. cochineal for - - - - -	130	0	0
		November		

		l	s	d
November 29, 1778.				
14	Sold 2 pipes of our canary, at 25l. -	50	0	0
December 5				
14	Divided between E. Ellis, N. Norton, and myself, our remaining 12 pipes canary, at 22l. - - -	264	c	0
6				
15	Received advice from James Conyers of Hamburg, that he hath received and disposed of my goods, the neat proceeds, as per account of sales, amounting to 676l. 15s. 6d. Flemish, exchange 34s. 6d. makes sterling - - -	392	6	8
14				
15	Sold Timothy Clarkson 500 yds. Scotch linen, at 2s. 10d. - - -	70	16	8
18				
15	James Conyers hath remitted to me in full exchange, at 34s. 2d. in bills as follows, viz. One on Charles Cooke for - 300 0 0 One on William Webster for 96 3 2½	396	?	2½
24				
15	Received of Nicholson and Co. in full for freight of ship Swallow's voyage to and from Lisbon - - -	25		0
26				
15	Sold Nicholson and Co. our ship Swallow, payable in 3 months - ship - - - w,	100	c	0
28				
15	Expences, house, servants, shop, &c. till Christmas, amount to - - -	9	2	8

THE
JOURNAL.

LONDON, January 1, 1778.

Sundries Drs. to Stock		£. 8333 6 0	l	s	d
1	Cash, for ready money - - -	5000 0 0			
2	Broad Cloth, for 300 yds. at	225 0 0	}		
	15s. a yd. - - - - -				
2	Linen, for 1200 yards. at 2s. 6d.	150 0 0	}		
	a yd. - - - - -				
2	Lead, for 800 pieces, wt. 44 tons	704 0 0	}		
	at 16l. a ton - - - - -				
3	Rum, for 25 puncheons, at 38l.	950 0 0	}		
	a punch. - - - - -				
3	Sugar, for 12 hhds. qt. 140 cwt.	304 6 0			
3	Ship Endeavour, for $\frac{3}{4}$ cost - -	300 0 0			
4	William Johnson, per-note due	200 0 0	}		
	the 1st March - - - - -				
4	James Gibson, per bond bearing	500 0 0	}		
1	interest at 5 per cent. from				
	the 1st November - - - - -				
		8333 6 0			
Stock Dr. to Sundries		£. 272 14 6			
1	To Mr. Edward Young on de-	120 0 0	}		
4	mand - - - - -				
4	To Charles Wilson, Esq. the 12th	87 4 0	}		
	inst. - - - - -				
5	To William Mercer, per ac-	65 10 6	}		
	count - - - - -				
		272 14 6			

Jan.

		l	s	d
Jan. 4, 1778				
5	<i>Shalloon Dr. to Cash</i> £.25 0 0	25	0	0
1	For 400 yds. at 1s. 3d. a yd. - - - -			
7				
4	<i>Edward Young Dr. to Cash</i> £.120 0 0	120	0	0
1	Paid him in full - - - -			
12				
5	<i>Oporto Wine Dr. to Isaac Onslow</i> £.162 0 0	162	0	0
5	For 18 hhds. at 9l. per hhd. - - - -			
17				
4	<i>Charles Wilson, Esq. Dr. to Cash</i> £.87 4 0	87	4	0
1	Paid him in full - - - -			
23				
1	<i>Cash Dr. to Linen</i> £.23 15 0	23	15	0
2	For 150 yds. at 3s. 2d. a yd. - - - -			
24				
6	<i>Hops Dr. to Timothy Clarkson</i> £.93 3 0	93	3	0
6	For 12 bags, qt. 40 cwt. 2 qr. at 46s. a cwt. payable in 2 months - - - -			
30				
6	<i>Lisbon Wine Dr. to Rum</i> £.200 0 0	200	0	0
3	For 20 hhds. at 10l. a hhd. received in barten for 5 puncheons, at 40l. a punch. -			
Feb. 2, 1778				
7	<i>Thomas Draper Dr. to Broad Cloth</i> £.90.	90	0	0
2	For 100 yds. at 18s. a yd. - - - -			
6				
<i>Voyage to Jamaica Dr. to Sundries.</i>				
7	£.443 4 2			
2	To Linen, 800 yds. at 2s. 6d. 100 0 0			
2	To broad cloth, 200 yds. at 15s. 150 0 0			
7	To Thomas Draper, for 8 ps. } 152 0 0			
	Holland, at 19l. - - - -			
1	To Cash, for duty, insurance, &c. 41 4 2			
		443	4	2

Feb. 8, 1778		l	s	d
7	Scotch Linen Dr. to Sundries £. 175 0 0			
1	To Cash, in part, for 1500 yds. } 50 0 c			
	at 2s. 4d. - - - - - }			
7	To Tho. Draper, for a bill on him 50 0 c			
4	To Charles Wilfon, Esq. for the rest 75 0 c			
		175	0	0
12				
5	Isaac Onslow Dr. to Rum £. 880 0 0			
3	For 20 puncheons, at 44l. - - - - -	880	0	0
19				
5	William Mercer Dr. to Isaac Onslow £. 50			
5	For a bill given to him for - - - - -	50	0	0
23				
8	Holland Dr. to Thomas Draper £. 360 0 0			
7	For 20 pieces, at 18l. - - - - -	360	0	0
27				
7	Thomas Draper Dr. to Cash £. 472 0 0			
1	Paid him in full - - - - -	472	0	0
March 4				
1	Cash Dr. to William Johnson £. 200 0 0			
4	Received of him in full - - - - -	200	0	0
7				
3	James Dixon, Dr. to Cash £. 1000 0 0			
1	Lent him, on bond, at 5 per cent. -	1000	0	0
9				
4	Charles Wilfon, Esq. Dr. to Lead £. 380			
2	For 20 tons, at 19l. a ton - - - - -	380	0	0
14				
	Sundries Dr. to Sugar £. 151 4 0			
1	Cash, in part for 54 cwt. at 56s. - 100 0 0			
8	David Robinson, rest in 2 months 51 4 0			
3		151	0	0

March

<u>March 14, 1778</u>		1	s	d
6	<i>Timothy Clarkson Dr. to Hops</i> £.58 15 0			
1	For 23 cwt. 2 qr. at 50s. sold to Eugene Arden, for which have received a bill on T. Clarkson, due at sight	58	15	0
<u>22</u>				
2	<i>Broad Cloth Dr. to Isaac Onflow</i> £.312 10			
5	For 500 yds. at 12s. 6d. bought of Geo. Wood, for which have given him a bill on J. Onflow	312	0	0
<u>27</u>				
5	<i>William Mercer Dr. to Cash</i> £.15 10 6			
1	Paid him in full	15	10	6
<u>30</u>				
9	<i>Profit and Loss Dr. to Cash</i> £.93 4 10			
1	For servants wages with house and pocket expences during the last quarter	93	4	10
<u>April 2</u>				
10	<i>Indian Chintz Dr. to Broad Cloth</i> £.210			
2	Bartered 300 yds. at 14s. for 10 pieces at 21l.	210	0	0
<u>5</u>				
1	<i>Cash Dr. to Ship Endeavour</i> £.94 13 8			
3	For my share of the neat gain from Michaelmas to Lady-day	94	13	8
<u>9</u>				
1	<i>Cash Dr. to Isaac Onflow</i> £.355 10 0			
5	Received of him in full	355	5	0
<u>Sundries Drs. to Lead</u> £.270 0 0				
10	Tea, 200lb. at 12s. a lb.	120	0	0
10	Muslin, 12 bales at 12l. 10s. a bale	150	0	0
2	Received in barter for 15 tons, at 18l. a ton	270	0	0

April

		April 15, 1778		1	s	d
6		<i>Timothy Clarkson Dr. to Cash</i> £.34 8 0				
1		Paid him in full - - - - -		34	8	0
		24				
		<i>Sundries Drs. to Lisbon Wine</i> £.172 10 0				
10		Cochineal, 1 cwt. valued at 120 0 0				
1		Cash, received in money - - - 52 10 0				
6				172	10	0
		Received in barter for 15 hhds. at 11l. 10s. a hhd.				
		May 1				
11		<i>Thomas Young Dr. to Sundries</i> £.199 10 0				
2		To Linen, 250 yds. at 3s. - - - 37 10 0				
2		To Lead, 9 tons, at 18l. - - - 162 0 0				
				199	10	0
		Delivered in barter.				
		<i>Sundries Drs. to Thomas Young</i> £.170 15 0				
11		Cinnamon, 120lb. at 8s. 4d. - 50 0 0				
11		Cotton, 34 cwt. 2 qr. at 3l. 10s. 120 15 0				
11				170	15	0
		Received in barter.				
		3				
		<i>Sundries Drs. to Sugar</i> £.116 0 0				
1		Cash, in part for 40 cwt. at 58s. 66 0 0				
11		Bills Receivable, one on Samuel Ward, for the rest, payable in 30 days - - - - - } 50 0 0				
3				116	0	0
		8				
		<i>Timoleon Jansen's Account Current Dr. to Sundries</i> £.453 11 10				
12		To Broad Cloth, 200 yds. at 14s. - - - - - } 140 0 0				
2		To Cash, for 10 tons lead, at 16l. 4s. with charges - } 184 18 7				
10		To James Horton, for 16 ps. druggetts, at 7l. 7s. } 117 12 0				
12		Profit and Loss, for my Commission - - - - - } 11 1 3				
9				453	11	10

May

May 13, 1778		1	s	d
<i>Suspence Account Dr. to Sundries</i>				
12	£.153 6 8			
7	To Scotch linen, 1000 yds. at } 2s. 6d. - - - - -	125	0	0
5	To Shalloon, 400 yds. at 1s. 5d. - - - - -	28	6	8
		153	6	8
Sent to William Lawfon, desiring him to take them at the above prices, or return them.				
17				
1	<i>Cash Dr. to Profit and Loss</i> £.12 10 0			
9	For half year's interest of 500l. of James Gibson - - - - -	12	10	0
25				
<i>Cash Dr. to Timoleon Jansen's Account</i>				
1	Current £.250 0 0			
12	Drawn my bill on him for 1200 piaftres at 50d. each, payable to James Johnson or order, value received - - - - -	250	0	0
June 3				
1	<i>Cash Dr. to David Robinson</i> £.51 4 0			
8	Received of him in full - - - - -	51	4	0
7				
1	<i>Cash Dr. to Bills Receivable</i> £.50 0 0			
11	Received of Samuel Ward for the bill on him - - - - -	50	0	0
William Johnson Dr. to Holland £.240				
4	For 12 pieces, at 20l. a piece - - - - -	240	0	0
13				
<i>Sundries Drs. to Suspence Account</i>				
	£.153 6 8			
12	William Lawfon, for 500 yds. Scotch linen and 400 yds. shalloon, kept - - - - -	90	16	8
7	Scotch linen, 500 yds. returned - - - - -	62	10	0
12		153	6	8

July

		June 28, 1778	1	s	d
13	7	Abel Factor my Account Current Dr. to Voyage to Jamaica £.567 12 4½			
		For neat proceeds of 500 yds. linen, 200 yds. broad cloth, and 8 pieces Holland, amounting, per sales, to 794l. 13s. 4d. currency, exchange at 40 per cent.	567	12	4½
13	13	Voyage from Jamaica Dr. to Abel Factor my Account Current £.348 9 2			
		For cost and charges of 7 puncheons rum, 8 barrels indigo, and 6 hogsheds sugar, amounting, per invoice, to 487l. 16s. 10d. currency, exchange at 40 per cent.	348	9	2
		July 4			
4	9	James Gihson Dr. to Profit and Loss £.300 0 0			
		For a legacy left me by my uncle Hum- phrey Adams, and payable by ditto Gib- son, his executor - - - - -	300	0	0
		8			
9	1	Profit and Loss Dr. to Cash £.130 0 0			
		For house and shop expences, and servant wages till Midsummer - - - - -	130	0	0
		13			
4	13	Edward Young Dr. to Abel Factor my Ac- count Current £.219 3 2½			
		For my bill on him, payable to ditto Young, value due by him, at 14 days	219	3	2½
		23			
		Voyage from Jamaica Dr. to Cash £.83 4 8			
13	1	For freight, duty, and other charges paid here - - - - -	83	4	8

July

July 23, 1778		l	s	d
<i>Sundries Drs. to Voyage from Jamaica</i>				
£. 140 0 0				
1	Cash, in part for my 6 hhds sugar	70	0	0
8	David Robinson, for the rest	70	0	0
13	at 6 months			
		140	0	0
25				
<i>Sundries Drs. to Voyage from Jamaica</i>				
£. 273 10 0				
3	Rum, 7 puncheons at 23l.	161	0	0
13	Indigo, 8 barrels, qt. 125 lb.	112	10	0
13	each, at 2s. 3d.			
		273	10	0
Brought into my warehouse.				
30				
<i>Cash Dr. to Edw. Young</i> £. 219 3 2½				
14	Received in full for my bill on Abel Factor	219	3	2½
4				
August 2				
<i>Fred. Van Dyke's Account of Goods Dr. to</i>				
<i>Cash</i> £. 12 14 6				
14	For custom, freight, wharfage, portorage			
14	&c. paid here on 5 butts currants and			
	12 casks raisins sent me here by the			
	Do'phin, James Scot master, to sell			
	for him	12	1	6
7				
<i>Cash Dr. to W. Lawfen</i> £. 50 0 0				
14	Received in part	50	0	0
12				
10				
<i>Cash Dr. to Fred. Van Dyke's Account of</i>				
<i>Goods</i> £. 134 8 0				
14	For his 5 butts currants, qt. 84 cwt. at 1l			
15	12s,	134	8	0

August

		August 14, 1778			l	s	d
<u>8</u>		<i>James Dixon Dr. to Fred. Van Dyke's Account</i>					
		<i>of Goods £. 152 0 0</i>					
<u>15</u>		For his 12 casks raisins, qt. 76 cwt. at 2l.					152 0 0
		<hr/> 17 <hr/>					
		<i>Fred. Van Dyke's Account of Goods Dr. to</i>					
<u>15</u>		<i>Cash £. 2 0 6</i>					
<u>14</u>		For storage, brokerage, &c. paid - - -					2 0 6
		<hr/>					
		<i>Fred. Van Dyke's Account of Goods Dr. to</i>					
<u>15</u>		<i>Profit and Loss £. 7 10 6</i>					
<u>9</u>		For my commission on 326l. at $2\frac{1}{2}$ per cent. - - -					7 10 6
		<hr/> 26 <hr/>					
		<i>Fred. Van Dyke's Account Current Dr. to Sundries £. 182 3 5</i>					
<u>15</u>		To Sugar, 46 cwt. at 56s. - - -					128 16 0
<u>3</u>		To cash, for 6 hhds. tobacco, } 48 18 7					
<u>14</u>		with custom, &c. - - - }					
<u>9</u>		To Profit and Loss, for my } 4 8 1					
		commission. - - - }					
		<hr/>					18 3 5
		<hr/> September 2 <hr/>					
		<i>Fred. Van Dyke's Account Current Dr. to Cash</i>					
		<i>£ 81 6 $3\frac{1}{2}$</i>					
<u>15</u>		For a bill sent him of 866 guilders, exchange					
<u>14</u>		at 35s. 6d. drawn by Thomas Younge on					
		James Jolliffe of Amsterdam - - -					81 6 $3\frac{1}{2}$
		<hr/> 9 <hr/>					
		<i>Cash Dr. to Profit and Loss £. 25 0 0</i>					
<u>14</u>		For 6 months interest of 1000l. of James					
<u>9</u>		Dixon - - - - -					25 0 0

September

		September 20, 1778		l	s	d
		<i>Voyage to Hamburg Dr. to Sundries</i>				
		£. 355 2 8				
15	To Cotton, 34 cwt. 2 qr. at	}	120	15	0	
11	3l. 10s. - - - -					
10	To Indian Chintz, 10 pieces		210	0	0	
	at 21l. - - - -	}				
14	To cash, for custom, &c. - - -		24	7	8	
				355	2	8
		24				
		<i>Bill's Receivable Dr. to Oporto Wine</i> £. 120				
11	For 12 hhds. at 10l. for payment have	}				
5	taken a bill on William Jones, due in					
	3 days - - - -		120	0	0	
		30				
14	<i>Cash Dr. to Ship Endeavour</i> £. 58 13 2			58	13	2
3	For my share of the gain since Lady-day					
		October 4				
14	<i>Cash Dr. to Bills Receivable</i> £. 120 0 0			120	0	0
11	For J. Dixon's bill on William Jones					
		8				
		<i>Sundries Drs. to Muslin</i> £. 150 0 0				
16	William Anderson my account	}				
	in co. for my half share of 12		75	0	0	
16	bales at 12l. 10s. - - -					
10	William Anderson, for his share -		75	0	0	
				150	0	0
		Profit and Loss Dr. to Cash £. 110 3 4				
9	For house expences, &c. till Michaelmas			110	3	4
14		12				
14	<i>Cash Dr. to William Anderson</i> £. 75 0 0			75	0	0
16	Received for his share of 12 bales muslin					

October

October 14, 1778		1	s	d
16	William Anderson my Account in Co. Dr. to			
	Cash £. 72 0 0			
14	For my share of 12 hhds. tobacco paid him	72	c	0
<hr/>				
16	Tobacco in Co. with Samuel Edwards Dr. to			
	Adam Ainsley £. 77 0 0			
17	For 14 hhds. at 5l. 10s. bought of him in co.			
	due on demand - - - - -	77	0	0
<hr/>				
16				
	Ship Swallow in Co. with Samuel Edwards			
17	Dr. to Sundries £. 920 0 0			
14	To Cash, for my $\frac{1}{2}$ share paid	460	0	c
17	To Sam. Edwards, for his $\frac{1}{2}$	460	0	c
		920	c	0
<hr/>				
21				
	Sundries Drs. to William Anderson my Account			
	in Co. £. 193 7 4			
18	Kersey's, 15 pieces at 6l. - - -	90	0	0
11	Bills Receivable, 1 on Geo. Drake	50	0	0
14	Cash, received in money, being	53	7	4
16	in full for my share neat pro- ceeds on muslin and tobacco			
		193	7	4
<hr/>				
24				
	Cash Dr. to Ship Swallow in Co. with Sam.			
	Edwards £. 25 0 0			
14	For 1 month's freight received of Nichol-			
17	son and Co. affreighters of said ship on a			
	voyage to Lisbon	25	c	0
<hr/>				
	Ship Swallow in Co. with Sam. Edwards			
	Dr. to Cash £ 13 10			
17	For the insurance of 900l. paid on her			
14	voyage to Lisbon, at 4 per cent.	13	10	0

October 25, 1778		l	s	d
<i>Ship Swallow in Co with Sam. Edward</i>				
<i>Dr. to Cash £. 14 6 4</i>				
$\frac{17}{14}$	For the repairs paid to Hugh Adams	14	6	4
<i>Cash Dr. to Tobacco in Co. with Sam. Edwards £. 98 0 0</i>				
$\frac{14}{1}$	For our 14 hhd. at 7l. —	98	0	0
<i>Tobacco in Co. with Sam Edwards Dr. to Cash £. 2 7 3</i>				
$\frac{16}{14}$	For carriage, &c. paid by me —	2	7	3
28				
<i>Adam Ainsly Dr. to Cash £. 77 0 0</i>				
$\frac{17}{1}$	Paid him in full for tobacco —	77	0	0
30				
<i>Tobacco in Co. with Sam. Edwards Dr. to Profit and Loss £. 3 10 11</i>				
$\frac{16}{9}$	For my commission at 2 per cent.	3	10	11
<i>Sam. Edwards Dr. to Cash £. 7 10 11</i>				
$\frac{17}{14}$	Paid him his share neat proceeds on our tobacco —	7	10	11
November 2				
<i>Voyage to Lisbon, per the Active, Capt. Brown, in Co. with Edm. Ellis and Nich. Norton Dr. to Sundries £ 984</i>				
18	To Edm. Ellis, for 650 yards broad cloth at 15s. }	487	10	0
19	To Nich. Norton, for 120 ps. flannel at 36s. — }	216	0	0
18	To Kerseys, 15 pieces at 6l. 90 0 0			
8	To Holland, 8 pieces at 18l. 144 0 0			
14	To Cash, for insurance, duty, &c. }	46	10	0
Addressed to Peter Thornton.		984	0	0
November				

		November 4, 1778		1	s	d
18	Edm. Ellis Dr. to Sundries	£. 159	10	0		
19	To Nich Norton, paid by him	112	0	0		
14	To Cash, paid by me - - -	47	10	0		
				159	10	0
14	Cash Dr. to Sundries	£. 512	10	0		
4	To James Gibson, for the principal - - -	500	0	0		
9	To profit and Loss, for interest	12	10	0		
				512	10	0
		6				
		Sundries Drs. to James Dixon		£. 1152		
14	Cash, received for myself and F. V. Dyke - - -	864	0	0		
9	Profit and Loss for my abatement - - -	250	0	0		
15	F. V. Dyke's Account of Goods, for his ditto - - -	38	0	0		
8				1152	0	0
		8				
		Madeira in Co. weth Edm. Ellis and Nich.				
19	Norton Dr. to Geo. Emerson	£. 450				
19	For 18 pipes at 25l. - - -			450	0	0
		9				
14	Cash Dr. to William Lawson	£. 40	16	8		
12	Received of him in full - - -			40	16	8
		11				
19	Geo Emerson Dr. to Sundries	£. 450				
18	To Edm Ellis, for goods accounted with him - - -	94	0	0		
19	To Nich. Norton, accounted with him for - - -	170	0	0		
14	To Cash, paid by me - - -	186	0	0		
				450	0	0
19	Sundries Drs. to Edmund Ellis	£. 56	0	0		
14	Nich. Norton, paid to him - -	20	0	0		
18	Cash, paid to me - - -	36	0	0		
				56	0	0

November

		November 12, 1778		l	s	d
		William Wright Dr. to Madeira in Co. with				
20		Edm. Ellis and N. Norton £. 108 0 0				
19		For 4 pipes at 27l. - - -		108	0	0
		13				
		Sundries Dr. to Madeira in Co. with E.				
		Ellis and N. Norton £. 84 0 0				
14		Cash, in part for 3 pipes at 28l. 34 0 0				
20		James Thompson, rest at 10 days 50 0 0				
19				84	0	0
		15				
		Canary in Co. with E. Ellis and N. Norton				
20		Dr. to Madeira in Co. with Ditto £. 308				
19		For 14 pipes at 22l. received in barter for				
		11 pipes at 28l. - - - - -		308	0	0
		16				
14		Cash Dr. to William Wright £. 108 0 0				
20		received for Madeira - - -		108	0	0
		19				
12		James Horton Dr. to Cash £. 117 12 0				
14		Paid him in full for T. Jansen's druggets		117	12	0
		23				
		Sundries Drs. to James Thompson £. 50				
14		Cash, received Composition - 30 0 0				
19		Madeira in Co. with E. Ellis and } 20 0 0				
20		N. Norton, allowed him }		50	0	0
		27				
11		Thomas Young Dr. Cochineal £. 130				
10		For 1 cwt. - - - - -		130	0	0
		29				
		Cash Dr. to Canary in Co. with E. Ellis and				
14		N. Norton £. 50.				
20		For 2 pipes at 25l. - - - - -		50	0	0
				December		

		December 5, 1778			l	s	d
		<i>Sundries Drs. to Canary in Co. with E. Ellis and N. Norton</i> £.264 0 0					
18		E. Ellis, for 4 pipes taken as his share	88				
19		N. Norton, for 4 ditto - - -	88				
21		Canary, for my 4 ditto at 22l. - -	88				
20				264	0	0	
		6					
		<i>James Conyers my Account Current Dr. to Voyage to Hamburg</i> £.392 6 8					
21		For neat proceeds of my adventure, 676l.					
15		15s. 6d. Flemish, exchange at 34s. 6d.		392	6	8	
		14					
		<i>Timothy Clarkson Dr to Scotch Linen</i> £.70 16 8					
6		For 500 yds. at 2s. 10d. - - -		70	16	8	
7							
		18					
		<i>Bills receivable Dr. to James Conyers my Account Current</i> £.396 3 2½					
11		Remitted me in full, exchange at 34s. 2d.					
21		in bills, viz.					
		One on Charles Cooke, for -	300 0 0				
		One on William Webster, for	96 3 2½	396	3	2½	
		24					
		<i>Cash Dr. to Ship Swallow in Co. with Sam. Edwards</i> £.25					
14		For freight of said ship of Nicholson and					
17		Co. - - - - -		25	0	0	
		26					
		<i>Nicholson and Co. Dr. to Ship Swallow in Co. with Sam. Edwards</i> £.1000 0 0					
2		For the said ship sold them payable in 3					
17		months - - - - -		1000	0	0	
		28					
9		<i>Profit and Loss Dr. to Cash</i> £.91 2 8					
14		For house, &c. expences till Christmas		91	2	8	

LEDGER,

LEDGER, 1778.

INDEX or ALPHABET.

A		B		C	
<i>Anderfon, Wm. my</i>	16	<i>Broad Cloth</i>	2	<i>Cash</i>	1, 14
<i>Account in Co.</i>	16	<i>Bills Receivable</i>	11	<i>Clarkson, Timothy</i>	6
<i>Anderfon, William</i>	16	<i>Balance</i>	22	<i>Cocbineal</i>	10
<i>Ainsley, Adam</i>	17			<i>Cinnamon</i>	11
				<i>Cotton</i>	11
				<i>Canary in Co.</i>	20
				<i>Canary</i>	21
				<i>Conyers my Acc. Cur.</i>	21
D		E		F	
<i>Draper, Thomas</i>	7	<i>Edwards, Samuel</i>	17	<i>Factor (Abel) my</i>	13
<i>Dixon, James</i>	8	<i>Ellis, Edmund</i>	18	<i>Account Current</i>	
<i>Dyke's Acc. of Goods</i>	15	<i>Emerson, George</i>	19		
<i>Dyke's Acc. Current</i>	15				
G		H		I	
<i>Gibfon, James</i>	4	<i>Hops</i>	6	<i>Johnson, William</i>	4
		<i>Holland</i>	8	<i>Indian Chintz</i>	10
		<i>Horton, James</i>	12	<i>Jansen's Acc. Cur.</i>	12
				<i>Indigo</i>	13
K		L		M	
<i>Kerseys</i>	18	<i>Linen</i>	2	<i>Mercer, William</i>	5
		<i>Lead</i>	2	<i>Muslin</i>	10
		<i>Lisbon Wine</i>	6	<i>Madeira in Co.</i>	19
		<i>Lawson, William</i>	12		
N		O		P	
<i>Norton, Nicholas</i>	19	<i>Oporto Wine</i>	5	<i>Profit and Loss</i>	9, 23
<i>Nicholson and Co.</i>	21	<i>Onslow, Isaac</i>	5		
Q		R		S	
		<i>Rum</i>	3	<i>Stock</i>	1
		<i>Robinson, David</i>	8	<i>Sugar</i>	3
				<i>Ship Endeavour</i>	3
				<i>Shalloon</i>	5
				<i>Scotch Linen</i>	7
				<i>Suspence Account</i>	12
				<i>Ship Swallow in Co.</i>	17
T		V		W	
<i>Tea</i>	10	<i>Voyage to Jamaica</i>	7	<i>Wilson, Esq. Charles</i>	4
<i>Tobacco in Co. with</i>	16	<i>Voyage from Jamaica</i>	13	<i>Wright, William</i>	20
<i>S. Edwards</i>		<i>Voyage to Hamburgh</i>	15		
<i>Thompson, James</i>	20	<i>Voy. to Lisbon in Co.</i>	18		
X		Y		Z	
		<i>Young, Edward</i>	4		
		<i>Young, Thomas</i>	11		
		K			

(1)	1778	Dr.	Stock.	Cr.	1778			
						fol	l	s d
Jan. 1		To Sundries, as per journal	Jan. 6	By Sundries, as per journal		8333	6	0
		To Balance, my neat worth	17 0	By Pr. and Lofs, gain this yr.		606	5	6
						8939	11	6
		<i>Cash</i>		<i>Cr.</i>				
Jan. 1		To Stock	1 5000	Jan. 4	By Shalloon	5	25	0
17		To Linen	2 23 15	7	By Edward Young	4	120	0
Mar. 4		To William Johnson	4 200	17	By Charles Wilson, Esq.	4	87	0
14		To Sugar	3 100	Feb. 6	By Voyage to Jamaica	7	41	0
April 5		To Ship Endeavour	3 94 13	8	By Scotch Linen	7	50	0
9		To I. Onilow	5 355 10	27	By Thomas Draper	7	472	0
24		To Lisbon Wine	6 52 10	Mar. 7	By James Dixon	8	1000	0
May 3		To Sugar	3 66	27	By William Mercer	5	15	0
17		To Profit and Lofs	9 12 10	30	By Profit and Lofs	9	93	0
25		To Timol, Janfen's Acc. Cur.	12 250	Apr. 15	By Tim. Clarkfon	6	34	0
June 3		To David Robinson	8 51 4	May 8	By T. Janfen's Acc. Current	12	184	0
7		To Bills Receivable	11 50	July 8	By Profit and Lofs	9	130	0
July 23		To Voyage from Jamaica.	13 70	23	By Voyage from Jamaica	13	83	0
					By Cash, carried to	14	3989	7 11
						6326	2	8

3778

Dr.

Broad Cloak.

١٢

1778

[illegible]

	Dr.	Hops	Cr.	1778	(6)
Jan. 24	To Tim. Clarkfon, at } 36s. a cwt. }	c q l s d 40 2 6 93 3 0	Mar. 14 By T. Clarkfon, at 50s. 23 2 By Balance, rem. at 46s. 17 0 22	c q l s d — — 58 15 0 39 2 0 — —	
	To Profit and Lofs, gained	9 4 14 0 — — 97 17 0		40 2 — — 97 17 0	
Mar. 14	To Hops - - - - -	6 58 15 c	Clarkfon, Cr. By Hops - - - - -	6 93 3 0	
Apr. 15	To Cath - - - - -	1 34 8 0	By Balance, due by him - - - - -	22 70 16 8	
Dec. 14	To Scotch Linen - - - - -	7 70 16 8		— — — —	
		163 19 8		163 19 8	
Jan. 30	To Rum, at 10l. a hhd. 20	3 200 0 0	Wine. Cr. By Sundries, at 11l. 10s. 15	bhds 172 10 0	
	To Profit and Lofs, gained	23 22 10 c	By Balance, rem. at 10l. 5	22 50 0 0	
		222 10 c		222 10 0	K ₄

[illegible]

	1778	Dr.	Holland.	1778	Cr.
Feb. 23	To Tho. Draper, at 18l.	20	7	36c	0
	To Profit and Loss, gained	23	24	0	0
			384	0	0
Mar. 7	To Cash lent him	-	100c	0	0
Aug. 14	To F.V. Dyke's Acc. of Goods	15	152	c	c
			1152	c	c
Mar. 14	To Sugar, due in 2 months	3	51	4	0
July 23	To Voyage from Jamaica } due in 6 months	13	7c	0	0
			121	4	0

Profit and Loss.		Cr.	
1778	1778		
Mar. 30 To Cash, for house expen. &c.	12	11	1
July 8 To Cash, for house expen. &c.	1	12	10
Oct. 8 To Cash, house, &c. expences	4	300	0
Nov. 6 To James Dixon, allowed	15	7	10
Dec. 28 To Cash, house, &c. expences	15	4	8
	14	25	0
	16	3	10
	14	12	10
	2	52	10
	2	11	5
	2	108	0
	3	130	0
	3	91	14
	3	153	6
	5	3	6
	5	12	0
	6	4	14
		943	8

(10)

1778

Br.

Indian Chinix.

Cr.

1778

		pcs	fol	l	s	d		pcs	fol	l	s	d
Apr. 2	To Bread Cloth, at 21l. } for }	10	2	210	0	0	Sep. 20	By Voy. to Hamburh, } at 21l. for }	10	15	210	0
Apr. 9	To Lead, at 12s. a lb. for 200 lb.	2		120	0	0		By Balance rem. at 12s.	200	22	120	0
Apr. 9	To Lead, at 12l. 10s. a } bale for }	12	2	150	0	0		By Sundries, at 12l. } 10s. for }	12	16	150	0
Apr. 24	To Lisbon Wine, for 1 cwt.	6		120	0	0		By Tho. Young, for 1 cwt.	11		130	0
	To Profit and Loss, gained	23		10	0	0						
				130	0	0						

K 6

(11)		1778		Dr.		Thomas Young.		1778		Cr.		
		fol	l	s	d			fol	l	s	d	
May 1	To Sundries	2	199	10	0	May 1	By Sundries					
Nov 27	To Cochineal	10	130	0	0		By Balance, due by him	22	170	15	0	
									22	158	15	0
			329	0	0					329	10	0
May 1	To Tho. Young, at 8s. 4d.	11	50	0	0		Cr.					
							By Balance, rem. at 8s. 4d.	120	22	50	0	0
May 1	To Tho. Young, at } c. qr.						Cr.					
	3l. 10s. }	11	120	15	0	Sep. 20	By Voyage to Ham- } c. qr.	15	120	15	0	0
							burg, at 3l. 12s. }					
							Receivable.					
May 3	To Sugar, 1 on Sam. Ward for	3	50	0	0	June 7	By Cash, received		1	50	0	0
Sep. 24	To Op. Wine, 1 on W. Jones	5	120	0	0	Oct. 4	By Cash, for Wm. Jones's bill	14	120	0	0	0
Oct. 21	To Wm. Anderson my Aco. }	16	50	0	0		By Balance, rem.					
	in Co. 1 on Geo. Drake }						1 on Geo. Drake, for 50 0 0					
							1 on Cha. Cooke, for 300 0 0					
Dec. 18	To Ja. Conyers my Acc. Cur.	21	300	0	0		1 on W. Webster, for 96 3 2½					
	One on Cha. Cooke, for	21	96	3	2½			22	446	3	2½	0
	One on Wm. Webster, for	21										
			616	3	2½							

(12)

1778

Dr.

Timoleon Jansen's Account Current.

Cr.

1778

		fol	1	s	d		fol	1	s	d
May 8	To Sundries	-	-	-	-	May 25	By Cash	-	-	-
							By Balance, due by him			
			453	11	10			22	203	11 10
									453	11 10
	Dr.						Horton.			
Nov 19	To Cash, in full	-	-	-	-	May 8	By T. Jansen's Acc. Current	12	117	12 0
	Dr.						Account.			
May 13	To Sundries, sent W. Lawfon					June 19	By Sundries	-	153	6 8
	Dr.						Lawfon.			
June 19	To Suspence Account	-				Aug. 7	By Cash, in part	-	50	0 8
						N. v. 9	By Cash, in full	-	40	16 8
								14		
								14		
									90	16 8

LEADER 1778.

229

(13)	1778	Dr.	Abel Factor, my Account Current..	Cr.	1778	fol	1778			1778	fol	1778		
							l	s	d			l	s	d
June 28		To Voyage to Jamaica, for neat proceeds }	June 28 By Voyage from Jamaica, }			7	567	12	4½		13	348	9	2
			June 13 By Edw. Young, for my bill }								4	219	3	2½
												567	12	4½
		Dr.		Jamaica. Cr.										
June 28		To Abel Factor my Account }	July 23 By Sundries, as per journal }			12	348	9	2			140	0	0
		Cur. for goods returned }	25 By Sundries brought into }									273	10	0
July 23		To Cash, for freight, duty, &c. }				1	83	4	8		23	18	3	10
							431	13	10			431	13	10
		Dr.		Cr.										
July 25		To Voyage from Jamaica, at 2s. 3d. }	By Balance, rem. at }			13	112	10	0		22	112	10	0
			lb. 1000 2s. 3d. }											

(14)

1778 Dr.

Cash.

Cr.

1778

LEDGER, 1778.

231

	fol	l	s	d		fol	l	s	d	
To Cash, brought from	1	98	7	11	Aug. 2	15	1	12	14	6
To Edward Young	4	219	3	2½	By F. Van Dyke's Ac. of Goods	15	15	2	0	6
To William Lawton	12	50	c	c	By Ditto	15	15	48	18	7
To F. Van Dyke's Ac. of Goods	15	134	c	c	By Ditto	15	15	81	6	3½
To Profit and Loss	9	25	c	c	Sept. 2	15	15	24	7	8
To Ship Endeavour	3	58	13	2	By Voyage to Hamburgh	15	15	110	3	4
To Bills receivable	11	120	c	c	By Profit and Loss	9	9	72	0	0
To William Anderfon	16	75	c	c	By W. Anderfon my Ac. in Co.	16	16	460	c	0
To W. Anderfon; my Ac. in Co.	16	53	7	4	By Ship Swallow in Co. with	17	17	13	10	0
do Ship Swallow in Co. with	17	25	c	c	S. Edwards	17	17	4	6	4
Sam. Edwards	17	98	0	c	By Ditto	17	17	2	7	3
To Tobacco in Co. with ditto	16	512	10	c	By Tobacco in Co. with ditto	16	16	77	0	0
To Sundries	8	864	c	c	By Adam Ainsley	17	17	7	10	11
To James Dixon	12	40	10	8	By Samuel Edwards	17	17	46	10	0
To William Lawton	18	36	c	c	By Voyage to Lisbon in Co.	18	18	47	0	0
To Edmund Ellis	19	34	0	c	with E. Ellis and N. Norton	18	18	186	c	0
To Madeira in Co. with E.	19	108	c	c	By Edmund Ellis	18	18	117	12	0
Ellis and N. Norton	20	30	c	c	By George Emerfon	19	19	91	2	8
To William Wright	20	50	0	0	By James Horton	12	12	51	33	6
To James Thompson	20	25	0	0	By Profit and Loss	9	9	65	48	63½
To Canary in Co.	20	25	0	0	By Balance, cash in my hands	22	22	65	48	63½
To Ship Swallow in Co. with	17	6548	0	3½						
Sam. Edwards	17	6548	0	3½						

1778		Dr.		Fred. Van Dyke's Account of Goods.		Cr.		1778			
				fol	1	s	d	fol	1	s	d
Aug. 2	To Cash, for cust. freight, &c.	4	12	14	6						
17	To Cash, for storage, &c.	14	2	0	6						
—	To Profit and Loss, for my commission }	9	7	10	6						
Nov. 6	To James Dixon, allowed him }	8	38	0	0						
	To ditto his Account Current in my hands }	15	226	2	6						
			286	8	0						

(16)

1778 Dr.

William Anderson my Account in Co.

Cr.

1778

		fol	l	s	d	fol	l	s	d
Oa. 8	To muslin, for my $\frac{1}{2}$ share 12 bales	10	75	0	0				
14	To cash, for my $\frac{1}{2}$ of 12 hhd's. tobacco	14	72	0	0				
	To Profit and Loss, gained	23	46	7	4		193	7	4
			193	7	4				
<hr/>									
<i>Dr. William</i>									
Oa. 8	To Muslin, for his $\frac{1}{2}$ share 12 bales	10	75	0	0				
<hr/>									
<i>Dr. Tobacco in Co.</i>									
Oa. 14	To Adam Ainsley, at 5l. 10s. 14 hhd's.	17	77	0	0				
25	To Cash, for carriage, &c.	14	2	7	3				
30	To Profit and Loss, Com- mission	23	3	10	11				
	To S. Edwards, his $\frac{1}{2}$ gained	17	7	10	11				
	To Profit and Loss, my gain	23	7	10	11				
			98	0	0				
<hr/>									
<i>Anderson. Cr.</i>									
	Oa. 14 By Cash, received for his $\frac{1}{2}$ share	14	75	0	0				
<hr/>									
<i>with Sam. Edwards. Cr.</i>									
	Oa. 25 By Cash, at 7l. for 14 hhd's.	14	98	0	0				

LEDGER, 1778.

233

(17)	1778	Dr.	Adam Ainsley	Cr.	1778
Oct. 28	To Cash, paid him in full	14	77	Oct. 14	By Tobacco in Co. with Sam. Edwards }
				with	Sam. Edwards. Cr.
Oct. 16	To Sundries, cost	14	920	Oct. 24	By Cash, for 1 month's freight
24	To Cash, for insurance	14	13	Dec. 24	By Cash, for freight
25	To Cash, for repairs	14	14	26	By Nicholson and Co.
	To Sam. Edwards, $\frac{1}{2}$ gained	17	51		
	To Profit and Loss, my gain	23	51		
			1050		
				Edwards.	Cr.
Oct. 30	To Cash, paid him his $\frac{1}{2}$ neat gain on tobacco	21	7	Oct. 16	By Ship Swallow in Co. for his $\frac{1}{2}$ paid
	To Nicholson and Co. $\frac{1}{2}$ due to him	22	500		By tobac. in co. for his $\frac{1}{2}$ gained
	To Balance due to him		11		By Ship Swallow in Co. his $\frac{1}{2}$ gained }
			518		
			12		
			9		

1778

Dr.

Kerseys

Ex.

1778

LEDGER, 1778.

235

	fol	l	s	d		fol	l	s	d
Oct. 21 To W. Anderson, my Ac. } in Co. at 6l. for 15 pcs. }	18	90	0	0	Nov. 2 By Voyage to Lisbon in Co. } with E. Ellis and N. Norton- } ton, at 6l. for 15 pcs. }	20	90	0	0
Dr. Voyage to Lisbon in Co.					E. Ellis and N. Norton. Cr				
Nov. 2 To Sundries, for goods and } charges }		984	0	0	By E. Ellis his $\frac{1}{3}$ remaining By N. Norton for one-third By Balance for my one-third	18 19 22	328 328 328	0 0 0	0
Dr. Edmund					Ellis. Cr.		984	0	0
Nov. 4 To Sundries - - -		159	10	0	Nov. 2 By Voyage to Lisbon in Co.	18	487	10	0
Dec. 5 To Canary in Co. - -	20	88	0	0	By Geo. Emerson, paid him	19	94	0	0
To Voyage to Lisbon in Co.	18	328	0	0	By Sundries, paid by him	19	56	0	0
To Balance, due to him	22	74	0	0	By Madeira in Co. $\frac{1}{3}$ gained By Canary in Co. $\frac{1}{3}$ gained	19 20	10 2	0 0	0
		649	10	0					649 10 0

(19)		1778		Dr.		Nicholas Norton.		Cr.		1778			

(20)

1778 Dr.

William Wright.

Cr.

	fol	1778				fol	1778		
		l	s	d			l	s	d
Nov. 12 To Madeira in Co. with E. } Ellis and N. Norton }	19	108	0	0	Nov. 16 By Cash, in full - -	14	108	0	0
Dr. James					Thompson. Cr.				
Nov. 13 To Madeira in Co. with E. } Ellis and N. Norton }	19	50	0	0	Nov 23 By Sundries - - -		50	0	0
Dr. Canary in Co. with E.					Ellis and N. Norton. Cr.				
Nov. 15 To Madeira in Co. with dit- } to, at 22l. for 14 pipes }	19	308	0	0	Nov 29 By Cash, at 25l. for 2 pipes	14	50	0	0
To E. Ellis, his 1-third gained	18	2	0	0	Dec. 5 By Sundries, at 22l. for 12 pipes }		264	0	0
To N. Norton, his 1-third dit.	19	2	0	0					
To Pr. and Loss, my 1-third dit.	23	2	0	0					
		314	0	0			314	0	0

LEDGER, 1778.

237

(23) F 11 A 65
F I N I S.

1778 Dr.

Profit and Loss.

Cr.

1778

	fol	l	s	d
To Voyage from Jamaica	13	18	3	10
<hr/>				
To Stock, neat gain this year	1	606	5	6
		624	9	4

	fol	l	s	d
By Profit and Loss, brought from	9	28	17	2
By Lisbon Wine, gained	6	22	10	0
By Voyage to Jamaica, gained	7	124	8	2½
By Scotch Linen, gained	7	16	13	4
By Holland, gained	8	24	0	0
By Cochineal, gained	10	10	0	0
By Voyage to Hamburgh, gained	15	37	4	0
By W. Anderfson my Account	16	46	7	4
in Co. gained	16	7	20	11
By Tobacco in Co. my ½ gained	17	51	1	10
By Ship Swallow in Co. my ½ gained	19	10	0	0
By Madeira in Co. my ½ gained	19	10	0	0
By Canary in Co. my ½ gained	20	2	0	0
By J. Conyers my Acc. Current	21	3	16	6½
		624	9	4

N. B. In the Press, and speedily to be published, *A Key* to this Arithmetick, containing the Solutions, at large, of all the Questions, in all the Rules of this Book. For the Use of such Preceptors and others who use the Book.

